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KANSAS ANTHROPOLOGICAL ASSOCIATION

The Kansas Anthropological Association is the oldest amateur archeological organization in the state. Its membership is made up of individuals and institutions interested in the prehistoric and historic peoples of the area. The objectives and goals of the Association are the preservation and interpretation of archeological and ethnographic remains within the state; the scientific study, investigation, and interpretation of archeological remains and ethnographical materials; the publication and distribution of information concerning Kansas archeology and ethnology; and the development and promotion of a greater public interest and appreciation for the heritage of the state.

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PUBLICATIONS

Each year members will receive six issues of the *Kansas Anthropological Association Newsletter* and two issues of *The Kansas Anthropologist*, the Association's journal. All members and interested individuals, professional or amateur, are invited to submit material to the editor for use in these publications. Five reprints will be provided free of charge to the author of each major article accepted. Additional reprints or back issues of the journal or newsletter, if available, may be ordered from the Historian-Recorder at the address listed above. Prices will be furnished upon request.

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LOWER WALNUT GREAT BEND: INVESTIGATIONS OF SITES NEAR ARKANSAS CITY, KANSAS BACKGROUND AND PRELIMINARY RESULTS

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Recent investigations of sites in the vicinity of Arkansas City were undertaken in conjunction with the proposed Arkansas City Bypass. The sites, long the focus of speculation and investigations, represent the remains of a vast Great Bend aspect (prehistoric/protohistoric Wichita Indian) settlement, occupied perhaps from the early 1300s to as late as the mid-1700s. These investigations revealed the presence of intact, subsurface cultural features (i.e., a post mold and trash-filled pits). The work adds to the stock of knowledge of the Great Bend aspect in the lower Walnut River and paves the way for extensive salvage-oriented excavations in advance of bypass construction.

"This land belonged to the Indians."
Bess Riley Oldroyd
Arkansas City historian

During the fall of 1992 and summer of 1993, the Kansas State Historical Society (KSHS) conducted archeological investigations within portions of the proposed Arkansas City Bypass right-of-way (Figure 1). The work developed as part of a cooperative agreement between the KSHS and the Kansas Department of Transportation (KDOT) to mitigate the effects of highway maintenance and upgrade on the archeological resources of the state. Archeological investigations were necessary to determine the number, extent, and age of any sites within the bypass corridor. Even before the work began, however, it was known that the areas affected by the new highway include portions of some of the most important archeological sites in the state. These sites, affiliated with the Great Bend aspect (the prehistoric and protohistoric Wichita Indians), bear the remains of a vast village complex, dating from as early as the early 1300s and possibly as late as the mid-1700s. Other sites identified include the remains of Euro-American farmsteads, dating from the latter part of the last century and into this century (Figure 2).

The areas specifically involved in the investigations were portions of the valley north of C Street Canal to the foot of the uplands and south of Madison Avenue. The proposed bypass, built in conjunction with a U.S. Army Corps of Engineers flood protection levee, splits from U.S. 177 north of Arkansas City and drops down onto the Walnut valley floor, roughly paralleling the Walnut River. As initially planned, the raised roadway would take a course between Arkansas City on the west and the river on the east before curving back to meet U.S. 177 again somewhat north of the Arkansas River. Subsequent to the investigations reported here, the plans were modified. The bypass, instead of continuing southward beyond Madison Avenue, would instead intersect that road and reconnect with 177 at the present junction of 177 and Madison. Despite the changes to the final route, the impact to the sites in the valley would not be lessened.

The Arkansas City Bypass is destined to be only one source of threat to the beleaguered

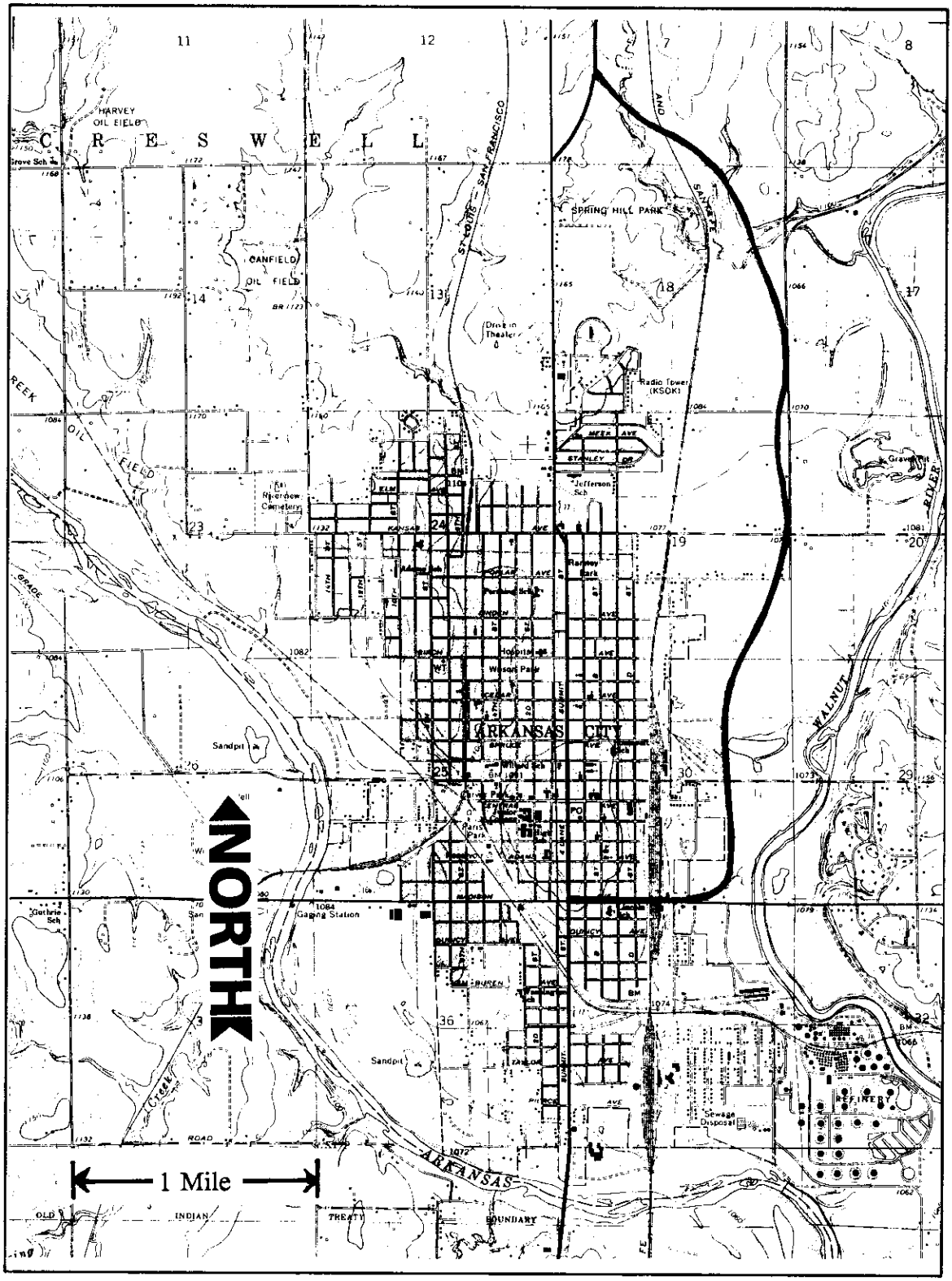

Figure 1. Map of Arkansas City showing the bypass, new U.S. 166 route, and proposed state furnished borrow areas (A, B, C). The shaded portion of A is the final recommended borrow area.

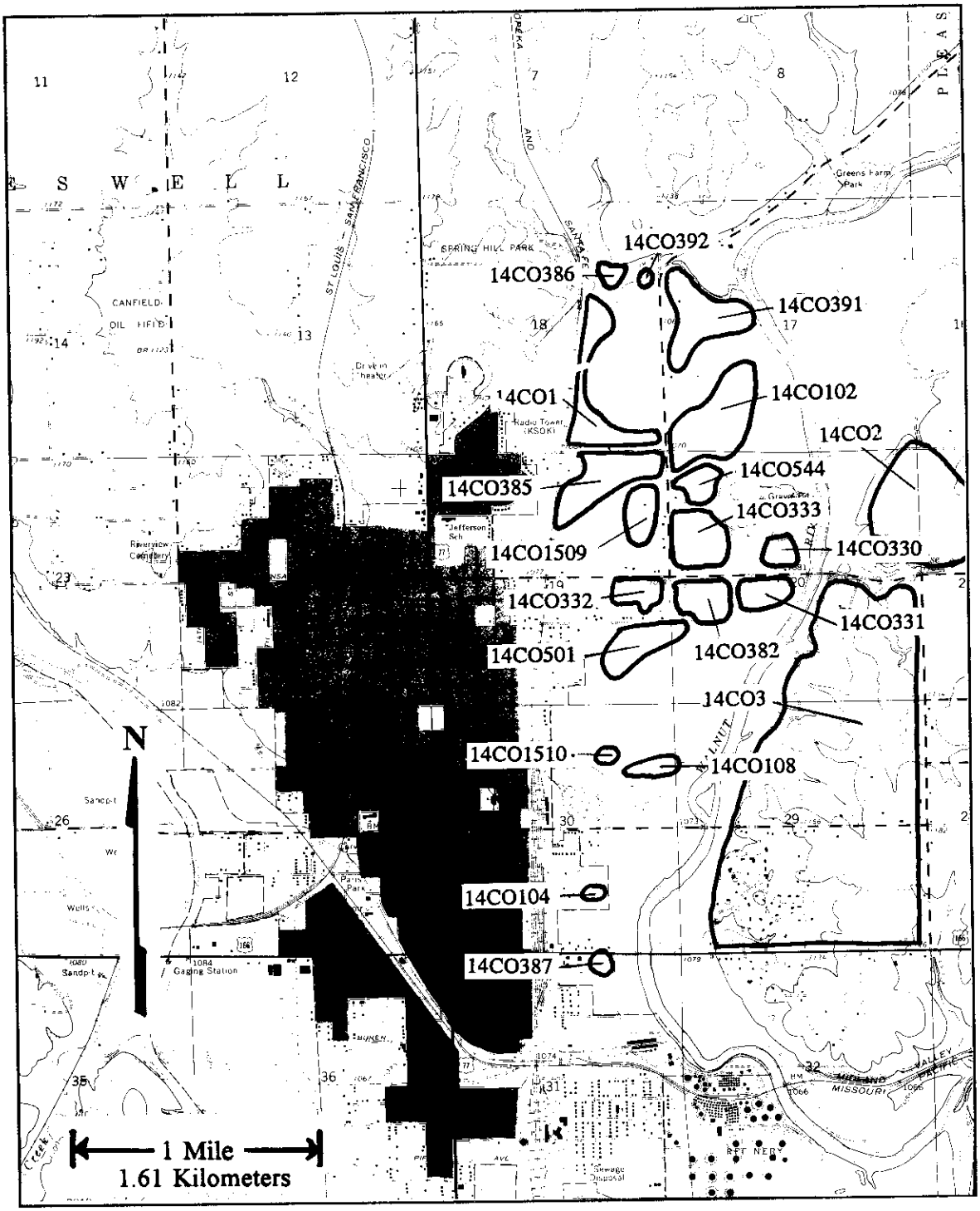

Figure 2. Map of Arkansas City, showing recorded archeological sites.

Great Bend sites in the valley. U.S. Highway 166 is also slated for eventual upgrade, its route altered from Madison Avenue to East Kansas Avenue. This upgrade, involving the construction of a new highway south of existing Kansas Avenue, will further impact more Great Bend sites, including a sliver of the Country Club site (14CO3), located on the grounds of the Arkansas City Country Club east of the Walnut River. Ultimately, too, the bypass, levee, and U.S. 166 upgrade will require over a million cubic yards of earth for fill--fill necessarily borrowed from the valley because the soil in the uplands is too shallow. The sum of these projects will signal a major destructive episode to the archeologically sensitive lower Walnut River valley (Figures 1 and 2).

THE ENVIRONMENT

The project area parallels the Walnut River, from about 1 mile northwest of its confluence with the Arkansas River to North Creek about 4 miles upstream. The gently undulating valley floor rises slightly toward the west with the town of Arkansas City situated on a low upland. The steep bluffs at the north end of the project area, to the east on the descending bank of the Walnut, and on the south side of the Arkansas River are formed by differential weathering of Permian-age, chert-rich limestones. Thus, Arkansas City and the project area lie on the boundary between two physiographic units, the Great Bend Lowland division of the Arkansas River Lowlands and the Flint Hills Upland division of the Osage Plains. Both are sections of the Central Lowland province of the Interior Plains of North America (Schoewe 1949:291-296).

An undulating plain of low relief, the Great Bend Lowland extends in a band 10 to 40 miles along the great northerly bend of the Arkansas River from around Dodge City through Great Bend and Wichita to Arkansas City. The wide, flat river valley is a poorly drained area of sand dunes and sandy plains, interspersed with plant- and animal-rich salt marshes, ponds, and sloughs. The surface materials consist almost entirely of sands and gravels, eroded from the Rocky Mountains during the Pleistocene and carried downstream by alluvial action.

The Flint Hills Upland, ranging from 20 to 80 miles wide, stretches north to south across the eastern half of Kansas, taking in such towns as Clay Center, Manhattan, Junction City, Abilene, El Dorado, Augusta, and Winfield. The rugged topography of this linear physiographic unit was formed by the exposure and consequent erosion of alternating beds of differentially resistant Permian-age limestones, sandstones, and shales. Stream courses within the region are generally eastward flowing and typically have deeply entrenched channels, lined with outcropping rock ledges.

The abundance of nodular bands of flint or chert in the limestones is perhaps the most important characteristic of the Flint Hills from an archeological perspective. Due to its superior flaking qualities, Flint Hills chert, especially that from the Florence formation, was much sought after by prehistoric peoples as an excellent raw material for chipped stone tools. Some of the best sources are found in the vicinity of Maple City about 15 miles east of Arkansas City and to the south near Hardy, Oklahoma (Haury 1979). Extensive prehistoric aboriginal quarry pits are scattered throughout the area.

The vegetation of the Great Bend Lowlands in prehistoric and early historic times apparently consisted of sand prairie with thin bands of floodplain forest along the Arkansas River. The potential natural vegetation of the prairie includes big and little bluestem, sandreed, and switchgrass. The forested areas contain hackberry, cottonwood, willow, elm, and various kinds of shrubs and bushes, with a decline in diversity moving from east to west (Kuchler 1974:597). The vegetation supported a wide variety of wildlife, including bison, elk, deer, antelope, and bear. Predators, such as wolf, coyote, cougar, and wildcat, were present along with smaller mammals, such as beaver, otter, porcupine, fox, ferret, badger, prairie dog, rabbit, and rodents. Quail and wild turkey were limited to available timber, but prairie chicken and grouse were plentiful throughout the region. Ducks, geese, and other water and shore birds could be found seasonally on marshy areas, sandhill lakes, and ponds (Wedel 1959:12). The Arkansas River and its tributaries contained edible fish and shellfish.

The potential natural vegetational community of the Flint Hills consists mainly of tall grass prairie, penetrated by narrow bands of riverine forest. The region is dominated by warm season grasses, the most important being big and little bluestem, switchgrass, and Indian grass. Moderate rainfall, coupled with a long growing season and rich soils, creates conditions suitable for numerous other grasses, annual and perennial herbs, and wildflowers (Mandel 1987:3.21-3.22). The thin bands of gallery along major streams are dominated by cottonwood, hackberry, willow, and elm. Hillsides and ravines along the edges of river valleys support burr oak with scattered bitternut and shagbark hickory. Black walnut, green ash, and sycamore prevail in lower areas. The total flora of the region includes approximately 700 species (Mandel 1987:3.22). The Flint Hills provided shelter and food for abundant mammalian fauna, similar to those listed for the Great Bend Lowlands.

Salines or salt springs, found in the Great Bend Lowland, were of undoubted importance to the prehistoric inhabitants of the region. Salt is, of course, necessary to living systems, humans included. In a review of Wichita culture history, Vehik (1992:319) notes

> Salines. . .occur. . .along the Arkansas River in what is now north-central Oklahoma and south-central Kansas. Known salt springs in this area include a set yielding "large quantities of strong brine" near Gueda Springs, Kansas (Millington and Greer 1900:21).

When Arkansas City was chartered in 1872, the area contained as many as 150 springs. Many, if not most, of the springs ran fresh water, although a few may have been saline. Some of these springs issued from solution caves formed in the limestone bedrock of the uplands. As demands for water have increased over time, many of the springs have ceased to flow. In addition, siltation, the result of clearing and breaking land for tillage, has concealed once prominent landfalls (bedrock shelves) in the Arkansas River. In early times these landfalls afforded solid crossing points on the river (Robert Reynolds, personal communication, 1992).

PREVIOUS INVESTIGATIONS IN THE ARKANSAS CITY AREA

The lower Walnut River valley belonged to the Indians. From the time of settlement of the Arkansas City area, it must have been obvious to all who cared that the area was saturated with Indian relics. The date of the earliest "investigations" of the sites is unknown, but those first reported were made in the mid-1890s.

In 1896 Charles N. Gould, a geology undergraduate at Southwestern College in Winfield, Kansas, and other members of the Cowley County Historical Society visited the area that is now the Arkansas City Country Club and initiated investigations. The mounds, which were estimated to number about a dozen, "have been greatly worn down, are circular in shape, from 20 to 30 feet in diameter, and from 2 to 5 feet high in the center" (Gould 1898a:80). Three of these mounds were found to conceal deep ash and artifact filled pits; some of the pits were as deep as 10 feet. In addition to the usual range of artifacts--pottery, grinding stones, hammerstones, arrowpoints, and the like, Gould also reported the remains of "buffalo, elk, deer, rabbit, two species of mice, coyote, together with remains of tortoise, a gallinaceous bird [pheasant or quail], and fish." Gould (1898a:80) worried about the fate of the area's archeological remains:

> A few years since a cellar was dug on the site of one of these mounds, and a gentleman informed us that a half bushel of stone axes were thrown out in the loose dirt and carried away by people in the vicinity. It is to be regretted that these relics, which are of no little scientific value, should be lost by those who have so little appreciation of their importance.

The following year, and perhaps inspired by the Cowley County Historical Society's example, Charles N. Hunt, Dr. C. S. Acker, M. B. Vawter, and another man "formed a small private company for exploration of some of these

mounds." According to Hunt's son, Edwin Hunt (1930), "They spen[t] about $500 in excavation and research work, and gathered a large mass of Indian curios," allegedly including some historic trade goods--"the remains of several flintlock rifles"--all of which "they had on display in a building on one of the main corners of the city." Tragically, the building burned one night, and the collection was consumed by the fire. Notably, no other mention of historic items was made in any of the published accounts or in a letter by Acker to the Smithsonian Institution (see Wedel 1959:355-356).

A brief, tantalizing report was given by an observer to the work in 1897 in the pages of *The Antiquarian*, an archeological journal published in Columbus, Ohio:

> Recent excavations made into prehistoric mounds. . .in Cowley county. . .have brought to light the fact that the largest of them is a "sacrificial mound," and the explorers have uncovered a sacrificial alter. . . . The investigators. . .tunneled into the interior of the mound, came upon a number of stones so arranged as to form a vault or a small chamber (Johnson 1897:95).

Below this chamber they found a layer of ash, "[m]ixed with these were. . .a few charred pieces of human bone, such as a femur of a child, two vertebrae--the axis and atlas." Another layer of ash and the excavators were upon "a reddish brown cement," which filled in around a supposed stone altar (Johnson 1897:95). The approximate 8-foot depth of the so-called altar, said to be stones in the shape of a human heart and pelvis, indicates that the men were in a deep storage pit, the base of the pit likely terminating at bedrock. More interesting was the mention of "[s]tone hammers, flint hatchets, flint knives, stone pipes, portions of a necklace, arrow points, spear heads, bones of animals and men and various pieces of pottery" (Johnson 1897:96). One piece of pottery stood out: "It is highly decorated and colored, and is a very superior piece of work. The decoration consists of three parallel lines, one blue and two red, running around the pottery at the top" (Johnson 1897:96). Conceivably, this represented some type of exotic tradeware.

Nearly 20 years passed before the sites received any further mention. In 1916 an Arkansas City collector named Albert F. "Bert" Moore, along with University of Kansas paleontologists Handel T. Martin and John Sterling, used a team of horses and a scraper to grade down a mound, apparently also on what is now the Country Club grounds. In the process of leveling the mound, four pits were revealed. A burial was found in one of the pits; the skeletal remains were said to have been removed to the University of Kansas (Remsburg 1917:8; Wedel 1959:355). Thirteen years later a torrential downpour unveiled the partial skeleton of a mammoth on 140-Foot Hill on Moore's farm south of Arkansas City (Figure 3). Martin, as well as paleontologists and geologists from numerous other institutions in Kansas and Oklahoma, rushed to the farm to secure as many of the remains as they could for their respective institutions (Robert Reynolds, personal communication, 1992). Apparently no cultural materials were found in association.

The turning point in the archeology of the lower Walnut River and the bluffs that towered above it came in 1940. In the summer of that year, Waldo R. Wedel of the Smithsonian Institution excavated portions of the three sites in the immediate vicinity of Arkansas City: Larcom-Haggard (14CO1), Elliott (14CO2), and the Country Club site (14CO3) (Figure 4). The Larcom-Haggard site is located northeast of Arkansas City on a narrow terrace between an east-facing limestone bluff (Scripture Hill, as it is called) and an abandoned channel of the Walnut. The first site to be investigated by Wedel, it yielded a wide assortment of artifacts from 25 to 30 trash-filled caches, basins, and shallow middens. Most of the pits were small, cylindrical in shape, and unlined. The fill contained ash, charcoal, potsherds, including four southwestern trade sherds and three sherds from cultures in the southeast, chipped and ground stone, shell, animal bone, and burned and unburned limestone fragments. A circular, shallow pit south of the main cluster of features was interpreted by Wedel to be a cache of raw lithic materials (Wedel 1959:347-349, 363).

Figure 3. Mammoth remains on the Moore farm south of Arkansas City in 1929. Photo courtesy of Robert Reynolds, Arkansas City, Kansas.

The Elliott site is situated on the rolling uplands east of the Walnut River, just to the north of the Country Club site. Surface evidences of the site in 1940, after many years of cultivation, consisted principally of abundant chert fragments, broken animal bones, and occasional pottery sherds. Wedel and his crew spent three days excavating on the site, locating promising spots by their darker soil color. The discolored areas were thought by Wedel to mark the locations of former low refuse mounds, like those found on the Country Club grounds, that had been reduced by plowing. Others were clearly cache pits of undetermined function. These contained quantities of bone, flint chips, occasional artifacts, and bits of burned clay. Six

Figure 4. J. Mett Shippee and Richard "Gates" Slattery testing site in the Arkansas City area in 1940. Photo courtesy of Joan Shippee Wagner, Kansas City, Missouri.

former cache pits were identified, and a possible pithouse was excavated (Wedel 1959:349-351). According to a local informant, contacted by Thies (1991a:17),

> . . .several "graves" (apparently primary burials) were found in the 1930s when the gravel road was widened. The burials were reportedly located roughly due east of the farmhouse, on the east side of the road. One of the finds supposedly had Euro-American trade goods in association. All of the remains were thought to be Native American. The present-day whereabouts of the skeletal remains and grave goods is unknown.

East of Arkansas City and south of the Elliott site, a group of mounds punctuates the

bluffs east of and 100 feet above the tree-fringed Walnut River. The Country Club site, long the subject of speculation and investigative forays, included 10 to 15 low mounds scattered along the broad, rounded ridge and lesser mounds in the south-central and western parts of what is now a golf course. Wedel excavated one of the smaller mounds, recovering flint chips, an occasional endscraper, arrowpoint, or bone fragment, and a few shell-tempered pottery sherds. Features identified at the site consisted of a post mold, a shallow basin, and three large, bell-shaped storage pits beneath the mound. Cultural material recovered consisted of a pot, rim sherds, a Puebloan sherd, an adult human skull, a fragmentary infant skull, animal and fish bones, charred corn, stones, and ash. In fact the mound was found to be nothing more than refuse heaped over filled pits. Wedel felt that, contrary to popular opinion, the mounds were not primarily intended for inhumations, even though occasional human remains were found below the mounds (Wedel 1959:351-379). He noted, however, the possibility that the mounds may have served some ritual or ceremonial function, as they seem to elsewhere in the Caddoan world (Wedel 1959:357, 574). Thies (1991a) was informed by a local collector familiar with the site that many of the mounds were destroyed or the earth moved to other locations and landscaped.

Wedel's work in the Arkansas City area, succeeding investigations in central Kansas, was a touchstone for several reasons. Although so-called absolute dating techniques (i.e., radiocarbon dating) did not exist at the time of the work, Wedel was able to provide an age for the sites based on the southwestern sherds from Larcom-Haggard and the Country Club site. These sherds, of types rather precisely dated in the southwest via tree-ring dates, provided an age range of the sites from A.D. 1525 to 1650 (Wedel 1959:363). Moreover, Wedel was able to say that the sites resembled closely in content (e.g., pottery, chipped stone and bone tools, etc.) the Little River focus sites in Rice and McPherson counties of central Kansas and that all of these sites were attributable to the Great Bend aspect (Wedel 1947). In turn, the Great Bend aspect was strongly inferred to bé ancestral to the Caddoan-speaking Wichita (Wedel 1942, 1959).

Despite the numerous similarities in site assemblages, there are important and distinctive differences between the central Kansas sites and those in Cowley County. As a result, the sites in Cowley County were placed in a subunit of the Great Bend aspect appropriately called the Lower Walnut focus. Sites in Rice and McPherson counties formed the Little River focus (Wedel 1959:571) (Figure 5). The Little River sites give the impression of possessing a greater richness and diversity of cultural remains. Wedel (1959:379) suggested that the apparent differences in the artifact inventories might be the result of the larger sample size from the Little River sites. However, work subsequent to his in the Cowley County sites so far has not dispelled the perception that they are less "rich."

Other occasional digging was done here and there throughout the valley, such as in portions of Larcom-Haggard (or possibly in 14CO385, Radio Lane) by another local collector named Louis Essex (Wedel 1959:363). Following World War II, Albert C. Spaulding, while at the University of Kansas, visited sites in the Arkansas City area in the company of Bert Moore (Hawley 1992). In 1947 journalist Arch O'Bryant (1947) penned some observations on Wichita sites scattered throughout central and south-central Kansas, including the sites at Arkansas City. After that, a hiatus in reported archeological activities ensued and did not end until the late 1960s and early 1970s.

At that time Edward E. Salm, an assistant professor of sociology and archeology at Southwestern College in Winfield, began excavating sites in the Walnut valley. Salm (1971) and a number of his students were first called to the farm of C. O. McCollum on Big Badger Creek, a few miles upstream on the Walnut River from Arkansas City. Professor and students labored in what appeared to be the remains of a large village, said to stretch along both banks of the river for nearly a mile. Evidence was brought to light of houses: "Wooden posts were set in the ground around the perimeter of the hut and used for support. . .

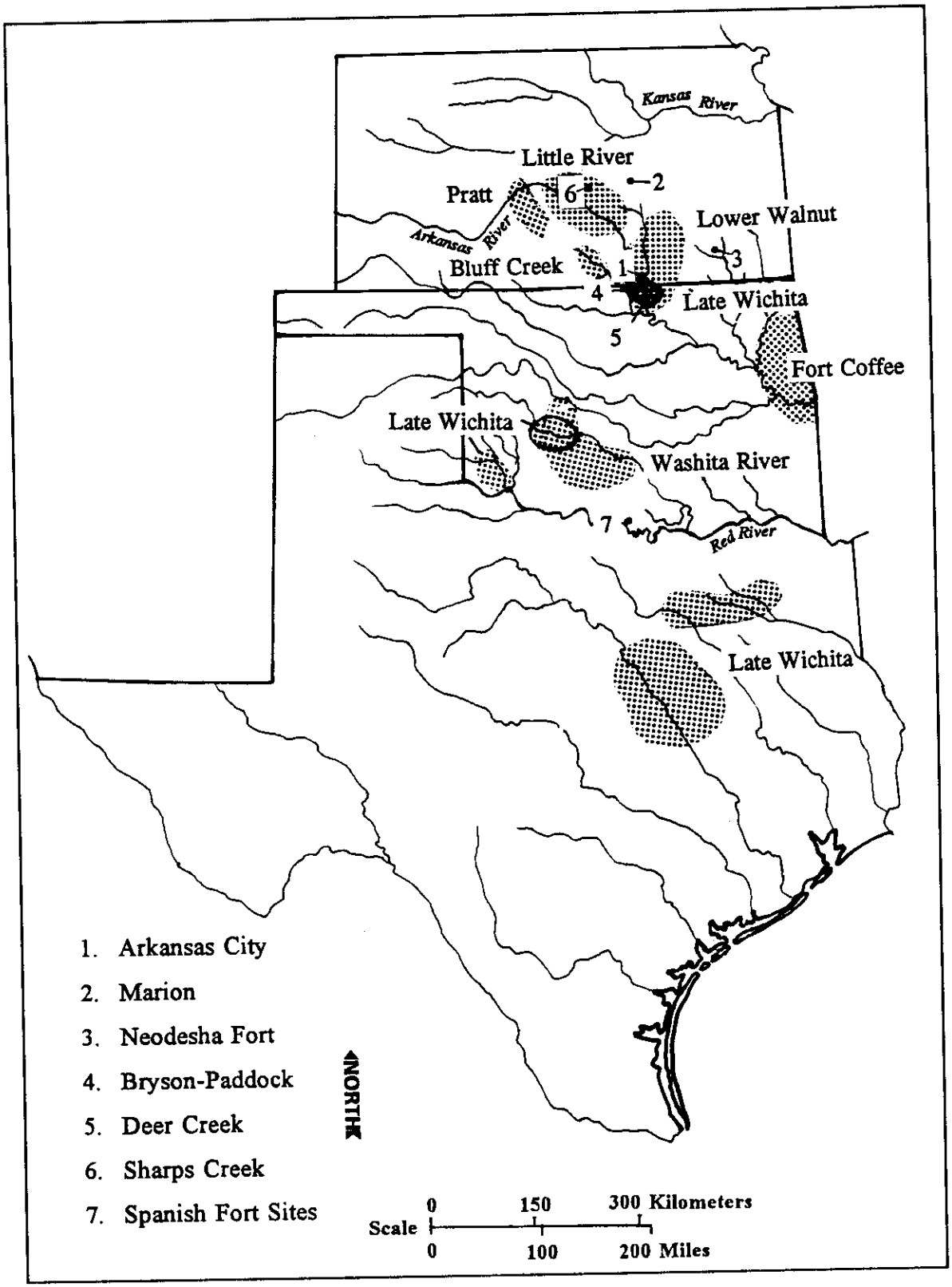

Figure 5. Cultural complexes and key sites.

when the poles finally decayed they left a different color in the soil. These were clearly visible" (Salm quoted in Wilcox 1975:8). The village revealed "[a] fairly complete tool inventory, the type of diet, housing and mode of transportation" (Wilcox 1975:8). On the west bank of the river, the excavators uncovered three human burials. Salm suggested an age for the sites as "sometime between the 1500s and 1700s" (Wilcox 975:7). Although he went on to speculate that he and his students had found evidence for a previously unknown civilization, Assistant State Archeologist John D. Reynolds (personal communication, 1993) was shown a portion of the collection in the early 1970s and believes it to be attributable to the Great Bend aspect. This view is fully consistent with information supplied by a local informant who reported Great Bend sites lining the Walnut valley between Arkansas City and Winfield and possibly beyond (Thies 1991a). In 1974 Salm and some students found bison remains and a hearth, ringed with stone and filled with ash and mussel shell, buried at a depth of 15 feet in the river bank (Wilcox 1975:8-9). Salm has since left Southwestern College. Despite considerable efforts to locate the collection by the late Don McBeth, a Winfield member of the Kansas Anthropological Association, it appears to have vanished (John D. Reynolds, personal communication, 1993).

More recently, a survey conducted by a private research firm, TECHRAD, as part of a local flood protection project was reported by A. V. Thoms (1979). Soon after, Arthur H. Rohn at Wichita State University (WSU) performed investigations in the upper reaches of Kaw Lake for the U.S. Army Corps of Engineers (Rohn et al. 1982). WSU archeologists also were involved in the bypass and levee project, investigating sites 14CO501, 14CO1509, and 14CO1510 for the Corps in the summer of 1992.

In 1990 Randall M. Thies of the KSHS Archeology Office fulfilled a contract with the Corps, as well as one coordinated with the related bypass project for KDOT (Thies 1991a, 1991b). Six extensive sites were investigated, and seven subterranean features were discovered at three sites: 14CO102, 14CO330, and 14CO333. An apparent pithouse and a storage pit were partially excavated on site 14CO102. Radiocarbon dates were obtained from two pits at 14CO330 and from the possible structure and another pit at 14CO102. Dates from the sites are A.D. 1325 ± 105 and A.D. 1370 ± 100 from the pits at 14CO330, A.D. 1560 ± 125 from the structure, and A.D. 1700 ± 60 from the storage pit. Another deep, trash-filled pit encountered during trenching for a Conoco gas pipeline at 14CO332 was studied, and enough charcoal was recovered for a radiocarbon assay. The date obtained was A.D. 1600 ± 80 years (Figure 6) (Thies 1991a, 1991c).

Investigations continued in 1991 under the direction of Virginia A. Wulfkuhle, also of the KSHS Archeology Office. Survey and testing at several sites, including the Country Club site (14CO3), was carried out for KDOT in conjunction with the proposed upgrade of U.S. Highway 166 and East Kansas Avenue (Wulfkuhle 1993). Survey, shovel testing, and test units revealed a trash-filled pit and a midden deposit on the north edge of 14CO3. Artifacts recovered include unnotched and side-notched arrowpoints, scrapers, chert flakes, potsherds, and three bison scapula hoes.

The survey and testing reported here were conducted by Marlin F. Hawley in the fall of 1992 and summer of 1993. During this same period (1990 to 1993), geomorphological studies were begun in the valley by Rolfe D. Mandel under the auspices first of the Corps of Engineers and then of KDOT. His research marks the first of an interdisciplinary nature in the lower Walnut drainage.

CULTURAL-HISTORICAL SETTING

Archeological investigations in the Great Bend Lowland and the Flint Hills regions in Kansas have revealed evidence of around 10,000 years of human occupation. Sites in the region usually represent habitation areas, small workshops, infrequent villages, burial mounds, and specialized sites, such as chert quarries and rock art sites. While the full extent of the culture history of the two regions has yet to be fully elucidated, it is clear that they contain materials attributable to all of the major cultural periods thus far identified in Kansas, i.e.,

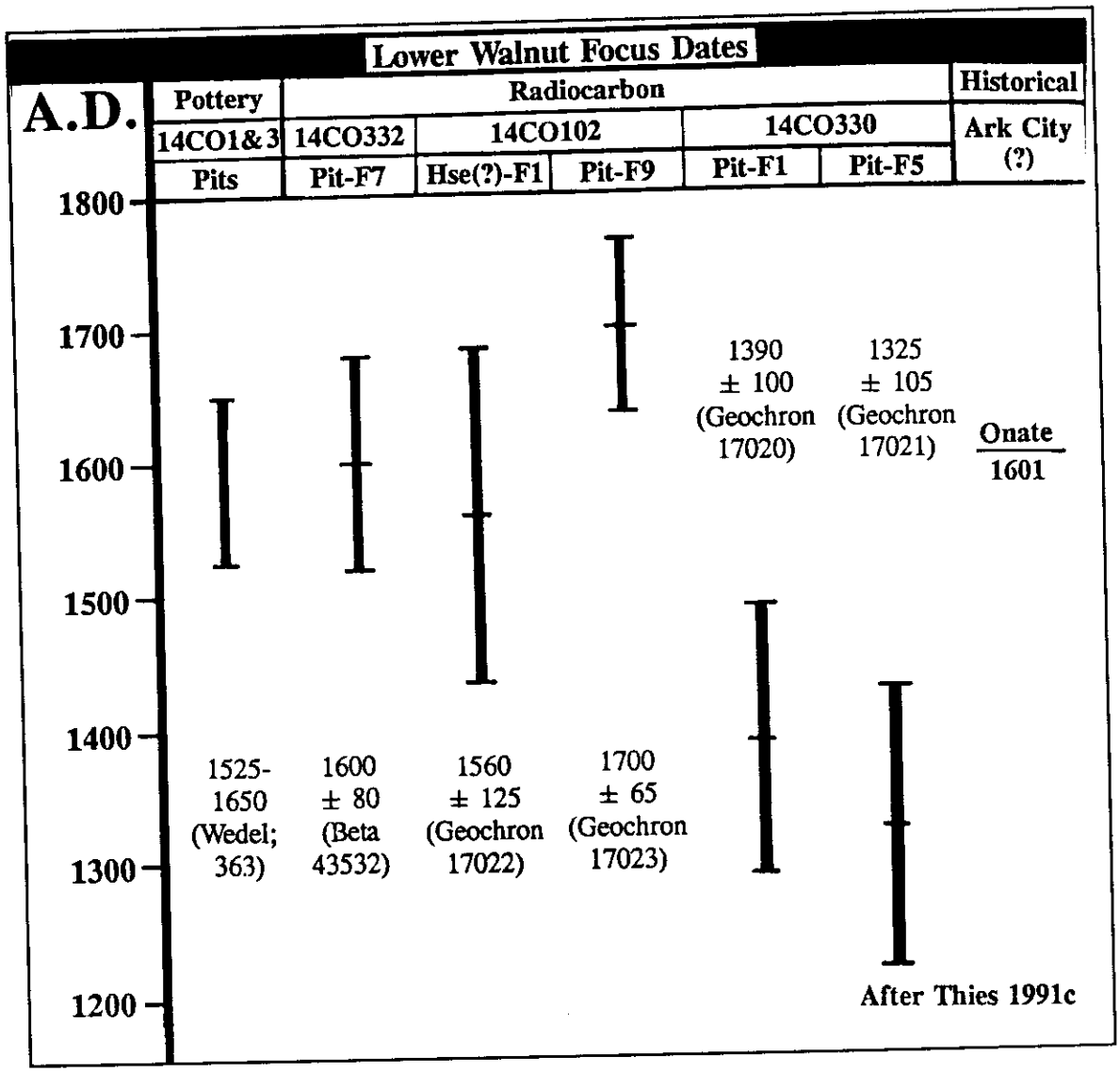

Figure 6. Lower Walnut focus dates, derived from sites near Arkansas City.

Paleoindian	circa 10,000 to 7000 B.C.
Archaic	circa 7000 B.C. to A.D. 1
Early Ceramic	circa A.D. 1 to 1000
Middle Ceramic	circa A.D. 1000 to 1500
Late Ceramic	circa A.D. 1500 to 1800
Historic	A.D. 1541 to present

Wedel's research and subsequent work in the lower Walnut River valley established the presence of only three cultural units: Early Ceramic, Late Ceramic, and Historic Euro-American. Evidence for Early Ceramic or Woodland cultures (A.D. 1 to 1000) in the lower Walnut River valley is scant. Thoms (1979) reported a single "Scallorn-like" projectile point, a type that occurred in both the Early and Middle Ceramic periods. A much more clear and rather dense concentration of Woodland sites were identified to the east in the nearby Grouse Creek valley during the Kaw Lake surveys, conducted by Wichita State University. Rohn et al. (1982) reported a medium-sized, corner-notched dart point from the upper reaches of Kaw Reservoir, and WSU archeologists found a Woodland point on the surface of 14CO501 during investigations there in 1992. Thies (1991a) reported an additional Woodland artifact, a thick, cord-roughened,

sand-tempered body sherd from 14CO544. Apparently the Woodland occupation of the valley was minimal, which is surprising given the abundance of Middle and Late Woodland sites in the Grouse Creek drainage (Rohn et al. 1982:14), not to mention the presence of a stable land surface in the valley after about 8,000 years ago.

The early dates from 14CO330 would place the initial Great Bend aspect habitation of the lower Walnut River valley in the Middle Ceramic period. In fact, it is in this period that the probable antecedent populations of the Great Bend are to be found. Two archeological complexes, Bluff Creek and Pratt, are both suggested candidates for the Great Bend ancestors (O'Brien 1984) (Figure 5). Sites of the Bluff Creek complex, as yet incompletely defined, lie to the west of the Lower Walnut focus in Sumner and Harper counties, Kansas (Witty 1978). The complex is dated from A.D. 1050 to about A.D. 1200 on the basis of four radiocarbon dates. Due to laboratory problems, three of the dates are likely in error. Even so, a recently obtained date from a site in Harper County falls into the early part of this range. At any rate similarities with the later Great Bend aspect include pottery vessel forms (but not temper), the bone and stone assemblage, and generally similar settlement pattern (O'Brien 1984). Interestingly, as with the Lower Walnut population, the Bluff Creek peoples relied heavily upon Kay County (Florence A) chert for the manufacture of stone tools (Gould 1975:110).

The Pratt complex is located somewhat to the northwest of the Bluff Creek sites in Pratt and Pawnee counties, Kansas (Figure 5). Wedel (1959:503-512) noted similarities between some of the Pratt ceramics and those of both the Little River and Lower Walnut foci. At the Larned site (14PN307) Earl Monger found the remains of small, oval to round Pratt houses, which appeared similar to the remains of later Great Bend aspect houses overlying them. Each occupation of the site was separated from the next by layers of silt (Monger 1970). Southwestern sherds from the site provide a date range from about A.D. 1424 to 1550 (Gunnerson 1987:93). Wedel (1959:510) suspected that Pratt has its origins to the south in Oklahoma. Gunnerson (1987:93) elaborated that Pratt possibly came out of the Custer phase through the Washita River phase (both Oklahoma complexes) and developed into the Great Bend aspect. Wedel (1978:158) has elsewhere suggested Fort Coffee, Washita, and Panhandle as having some input in the formation of the Great Bend aspect (see Figure 5). The suggestion made here is that Bluff Creek, which Witty (1978) suggests bears some affinities with Washita River as well, may be the direct precursor of the Lower Walnut focus. However, as Loosle (1991) correctly points out, until the collections from the excavated sites of both complexes are fully analyzed and the complexes defined, this is largely idle speculation.

The Late Ceramic or protohistoric period, which represents the time of first contact between native populations and European explorers, priests, and entrepreneurs, includes the remains of the Great Bend aspect habitation of the valley. Wedel (1959:586-588) believed the Lower Walnut population to be part of "a widespread and numerous semisedentary people practicing a maize-beans-squash horticulture, along with much hunting, some gathering, and perhaps a little fishing." They lived "in large rambling communities. . .without defensive works, on or near the immediate banks of the Walnut River, and probably on smaller streams in south-central Kansas." Their dwellings were similar to the grass lodges noted by Coronado in Quivira (assumed to be the Little River villages). Scattered along drainages, permanent villages had up to 200 grass-covered, oval to round dwellings of relatively light construction with interior hearths. Other structures included pithouses, arbors, ramadas, and sweat lodges. Associated with villages were low refuse mounds, possibly also having ritual or ceremonial functions, and bell-shaped storage pits (Wedel 1959). Absent from the Lower Walnut sites were the enigmatic earthworks called "council circles." Found associated with some of the Rice and McPherson county sites, the structures may have astronomical significance as solstice markers (Wedel 1967, 1968).

In terms of characteristic or diagnostic artifacts, Lower Walnut ceramics are

predominately Cowley Plain, a shell-tempered type consisting of bowls and ovate, flat bottom jars with simple or straight rims or recurved and flaring rims, loop handles, and plain surfaces. Exotic sherds, found at the Larcom-Haggard site, are indicative of cultural contacts with late prehistoric Caddoan cultures to the southeast, possibly Arkansas or Louisiana. Rio Grande glazed sherds, dating to A.D. 1525 to 1650, indicate trade with southwestern cultures (Wedel 1959:359-365). Small amounts of obsidian further demonstrate ties to the southwest (Wedel 1959:367-368). Stone implements include small, unnotched and side-notched, triangular arrowpoints, diamond-shaped, beveled knives, endscrapers, and drills. Bone items consist of bison scapula hoes, "squash" knives, beamers, fleshers, ornaments, and rasps for musical instruments. Shell beads and bracelets have been found. Despite the testimony of Edwin Hunt (who was surely misinformed) and the alleged association of burials and metal trade goods (which have disappeared) at the Elliott site, there is as yet no positive evidence of historic goods, such as guns, metal knives, etc., in the Lower Walnut focus sites (Brown 1987:16.10).

Important clusters of Great Bend sites have also been reported in Marion and Wilson counties (Wedel 1959) (Figure 6). At 14MN328 in Marion County, salvage work conducted by the KSHS Archeology Office uncovered evidence of two structures, one surface and one semisubteranean, as well as numerous storage pits (Lees 1987; Lees et al. 1989). The cultural inventory includes both shell-tempered and sand- or grit-tempered pottery, bone tools, small triangular arrowpoints, bone and pottery beads, red pipestone pipe fragments, as well as exotic items, such as a small turquoise bead, obsidian, and copper alloy artifacts of European origin (Lees et al. 1989). Wedel (1959:502) tentatively identified the Marion County sites with the Little River focus but, pending complete analysis of the cultural materials from 14MN328, this identification remains uncertain (William B. Lees, personal communication, 1993).

The sites in Wilson County include 14WN1 and 14WN2. The former, known as Neodesha Fort, contained earthworks, possibly a fortification. The earthworks are regrettably all but destroyed now (Weston and Lees n.d.). The site has yielded aboriginal material attributed to the Great Bend aspect. Reports of items of European manufacture (Wedel 1959:526-534), like claims of such artifacts at Arkansas City, remain unconfirmed (Weston and Lees n.d.). Site 14WN2 apparently was a village (Wedel 1959). These sites are probably those visited by the Frenchman Claude du Tisne in 1719 (M. M. Wedel 1982:22).

The Wichita or "Quivirans" were first contacted by Europeans in 1541. An expedition led by Francisco Vázquez de Coronado y Luxan, along with Franciscan friar Juan de Padilla, and a contingent of soldiers, servants, carriers, etc., entered the region called "Quivira" northeast of the Great Bend of the Arkansas River and south of the Smoky Hill River (Wedel 1942, 1959).

Spanish explorer Juan de Oñate and a large detachment of soldiers and missionaries traveled from the Rio Grande into the buffalo plains in 1601. In October of that year, they encountered a presumably Wichitan "great settlement." Based on information supplied by a captive Indian named Miguel, the community was called Tzanoa (Hammond and Rey 1953:874) or Etzanoa (Newcomb and Campbell 1982:32). The settlement contained

> . . .more than twelve hundred houses, all located on the bank of another fairly good-sized river which flowed into the larger one. The houses were all round, made of forked wooden poles joined together by sticks and on the outside covered with straw. Inside they had some mats at the sides which they used as beds or cots on which to sleep. Most of the houses, which were two spears high, were so large that they could hold eight or ten persons. All had a flat roof or terrace, about six feet high, with room for three or four persons, which they must have used in the summer, and which they entered through a suitable straw door. To enjoy the fresh air they climbed to the top by means of a portable wooden ladder; there was no house which did not have a terrace.

> We stayed at this pleasant place, surrounded everywhere by Indian cornfields and gardens. The cornstalks were as tall as those of New Spain [Mexico] and in some places even taller. The land is so fertile that even though the corn had just been harvested, there was a second crop about six inches high, without other cultivation or preparation of the soil than pulling up grass and making some holes in which the corn was planted. There were many beans and some calabashes, and plum trees between the planted fields. These were not irrigated fields, but depended on seasonal rains. . . . It was thought that it doubtless bordered on the tropics, as the people we saw went about naked, although some used skins (Hammond and Rey 1953:754-755).

Further testimony in New Spain added details:

> . . .the huts were grouped in barrios of 30 to 40, the huts being about 30 to 40 paces apart, and. . .the barrios were separated by two to three hundred paces. Surrounding each hut was a small cultivated plot where maize, beans, and calabashes were raised (Scholes and Mera 1940:274, quoted in Wedel 1959:62).

Wedel (1942:19) suggested the terminus for Oñate's journey to be the lower Walnut River. The location of Etzanoa is argued by Vehik (1986a, 1992) as being either near the confluence of the Walnut and Arkansas rivers in Kansas (see also Newcomb and Campbell 1982:33) or in Oklahoma near the point where Beaver Creek empties into the Arkansas. Unfortunately, present knowledge is insufficient for any definitive determination of the northern end of Oñate's trek (Vehik 1986a; Wedel 1942). Archeological work in the lower Walnut River valley has not yet produced anything conclusive either way (and may never). However, the sites were inhabited at the time of the Spanish expeditions (Thies 1991a).

Although his data provided only tentative impressions about time perspective within the Great Bend aspect, Wedel (1959:586) suspected that the Little River and Lower Walnut foci were at least partly contemporaneous, both flourishing during the Coronado-Oñate period. Lower Walnut may have persisted later than Little River, possibly representing in its later stages a southward drift of the Little River focus peoples. The late radiocarbon date obtained from 14CO102 lends support to this idea, although an eighteenth-century occupation of any duration should have included within its inventory at least a few European items. This seems especially true in light of the proximity of two eighteenth-century sites a few miles to the south in Oklahoma, namely Deer Creek (34Ka-46) and Bryson-Paddock (34Ka-70) (Figure 5). These two sites, occupied most intensively from A.D. 1700 to 1750, have never been thoroughly investigated, but surface collections and test excavations have revealed an extensive series of trade items, such as gun parts, gun flints, knives, axes, scissor blades, pipes, ornaments, etc. (Figure 7). Deer Creek also had an earthen rampart of unknown use. The site may have

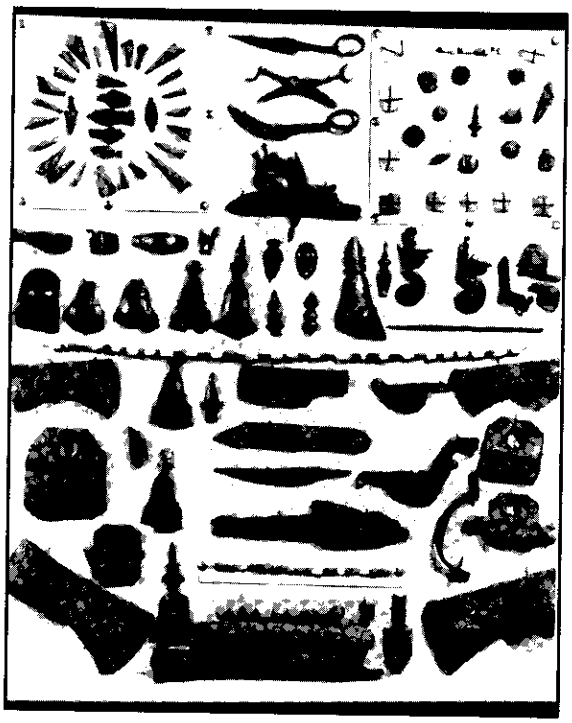

Figure 7. A selection of trade goods from the Deer Creek locality, Oklahoma. Bert Moore Collection. Photo courtesy of Dorothy Harbaugh, Enid, Oklahoma.

been a meat and hide processing center for trade with the French (M. M. Wedel 1981).

The early inland voyages of Coronado, Francisco de Leyva y Bonilla, and Antonio Gutiérrez de Humaña, Oñate, and others were but the first harbingers of the onslaught of explorers, traders, missionaries, militia, and colonizers to come (Newcomb and Field 1967). An interesting footnote is that de Humaña's 1593 expedition into the plains was wiped out, possibly by the Wichita or even the Pawnee; chain mail removed from the dead is the likely source for that which shows up in the central Kansas sites (see Blaine 1982:113-114; Wedel 1975).

Not only did the pace of contact with Europeans increase but so, too, the supply of European goods, such as guns and horses. The Wichita had acquired the latter by 1683 (M. M. Wedel 1982:132). European manufactured items were highly prized by aboriginal populations and the introduction of these goods created intense competition. Raiding of enemy encampments netted horses and slaves.

Concurrent with the introduction of goods and new technologies, and also fraught with profound consequences, were the inadvertent spread of new diseases and ecological transformations (i.e., new plants, animals, and relationships between plants and animals and humans). As a consequence of life in what some anthropologists have dubbed "the tribal zone" (Ferguson 1992), Wichita society underwent changes. While many of the changes, enacted in the social, political, and religious arenas, are largely invisible to the archeologist and ethnohistorian, others are not (M. M. Wedel 1982:31-37). Hamlets--in many instances probably formed of two or more Wichita-speaking bands--were replaced by villages of 1,000 to 1,250 people, fortified with stockades and earthworks. Houses may have become larger in this period. Archeological investigations at sites in central Kansas suggest that houses averaged 12 to 15 feet in diameter. Later houses, especially those documented in the 1800s, tended to be substantially larger in overall size. Elevated granaries were no longer built. The dead were buried on bluffs near settlements. Villages were still deserted, or nearly so, during the winter buffalo hunt from October to March (M. M. Wedel 1982:25, 31-37).

By 1700 Wichita populations were on the move, vacating the northern portion of their home range in the Smoky Hill region to head south and southeast to the Arkansas River as a result of pressure from increasingly hostile and well-armed tribes around them (M. M. Wedel 1982). Endemic warfare, involving the Wichita and Osage, Apache, Missouri, and some Pawnee, increased. Eventually, the stress of war and its effects on the aboriginal and European (French and Spanish) trade networks resulted in the abandonment of traditional homelands. By 1758 all of the Wichita bands of the Arkansas River basin apparently had left the region and moved to the Red River country, where they are known from sites such as the Spanish Fort sites (Morris 1970; M. M. Wedel 1982) (Figure 5).

The Wichita of recorded history were not a monolithic cultural entity but rather, in Mooney's term (1907:947), a "confederacy" of several bands, "each of which probably spoke a slightly different dialect of the common language." Wichita-speaking bands included "the Wichita proper (?), Tawehash (Tayovayas) [also Taovaya], Tawakoni (Tawakarehu), Waco, Yscani [Iscani], Akwesh, Asidahetsh, Kishkat, [and] Kirishkitsu." By the early part of the twentieth century, the only divisions still existing were the Wichita proper, the Tawakoni, and the Waco. The Kichai, a remnant population related to the Wichita but speaking a somewhat different tongue, were also incorporated within the Wichita tribe. Vehik (1992) has recently attempted to trace historic bands back through time to archeological populations using linguistic data from ethnohistoric accounts and archeological data. Through a series of derivations, the Wichita proper were traced to the Lower Walnut focus; the Tawakoni, ultimately to the Little River focus of central Kansas; the Taovaya/Tawehash, to the Great Bend sites near Marion, Kansas; and the Iscani/Waco, to the Wheeler phase in Oklahoma (Vehik 1992:326-329). While it seems probable that material culture variation between the two named Great Bend foci, Lower Walnut and Little River, may reflect band differences, there

remain a great many imponderables. Any such linkages will require further explication both in terms of the archeology and linguistic/ ethnohistorical data.

The Wichita, whose numbers at the time of first contact in 1541 have been estimated at 15,000 to 33,000, were reduced in number over the centuries by warfare and disease. In 1891 the Wichita totaled 426 individuals (Newcomb and Field 1967:340-349). Mooney (1907) gave a somewhat conflicting estimate of their population as 310 in the year 1902. As Newcomb and Field (1967:347-348) have observed, determining the actual size of the population at any given time is an exercise fraught with difficulty. By 1962 the tribe numbered 428, and Elam (1971) placed their 1970 population at 575 persons. The Wichita today reside in the vicinity of Anadarko, Oklahoma. According to Elam (1971:18), "some of the Indians are conscious of a blood kinship to one or more of the historical bands; all consider themselves Wichita."

After 1800 the territory formerly inhabited by the Wichita was occupied by other groups, namely the Osage. The Osage had hunted throughout western Missouri, northeastern Oklahoma, and southeastern and south-central Kansas since the 1600s. However, the Osage did not settle in villages in southeast Kansas until after 1800 (Connelley 1928:208; Newman 1957:46). In addition, innumerable temporary campsites were established along streams as various bands traveled to and from their bison hunting territory in the western part of the state. In 1820 white visitors observed Osage camps and gardens apparently along Grouse Creek in southern Cowley County (Rohn et al. 1982:16; Wedel 1959:344-346). Through a series of treaties, the Osage eventually relinquished all claims to land in Kansas and retreated to purchased lands in Oklahoma. Despite oral tradition and local legends of Osage sites in Cowley County, to date none has been so identified and documented.

White settlers began arriving in the area in the post-Civil War era, and Arkansas City was platted in 1870. Variously named Adelphi, Walnut City, and Creswell, the settlement was officially incorporated as Arkansas City in 1872. In its early years, "[w]hen the town was merely a settlement. . .[f]rom 50 to 100 Indians were camped continually on the Walnut River" (Berger and Oldroyd 1969:30). The Jesuit father Ponziglione, visiting the town in 1873, commented on its "lively Indian trade and. . . cosmopolitan population" (Beckman 1943:109). Growth was initially slow for the town until 1879 when the Atchison, Topeka and Santa Fe Railroad completed a connection to Arkansas City. The community developed a relatively diverse economy, although its fortunes were still closely allied to agriculture and ranching (Blackmar 1912:99-100). In 1893 the opening of the Cherokee lands in present-day Oklahoma prompted a land rush by thousands of settlers.

SPECIALIZED SITES: CHERT QUARRIES

An area of special importance to the Lower Walnut population were chert quarries located in the southern Flint Hills uplands. In particular, extensive quarry locales along Beaver Creek near Hardy, Oklahoma, and farther north near Maple City, Kansas, have been known for the better part of a hundred years (Gould 1898b, 1899). Reports of additional quarry locations, extending even farther north into Cowley County, remain unconfirmed (Gould 1899, 1921). Limited investigations were made of the quarries in the Hardy area by the Oklahoma Historical Society in 1926 (Spring 1967). During the 1930s a man named O. D. Sartin did considerable exploring in the quarries and caught the attention of the print media with news of a "fort" in the quarry area (*Topeka Daily State Journal* 1935). The fort may be nothing more than the extensive diggings in the Hardy vicinity. The quarries were visited by Wedel (1959:476-480) in 1940 and by Albert Spaulding in 1946 (Hawley 1992:32). Despite such attention, it has only been in recent years that systematic attempts have been made to study the chert, its extraction, and use by aboriginal populations through time (e.g., Banks 1990; Cooper 1975; Haury 1979, 1981; Vehik 1986b).

Florence A or Kay County chert is a medium grade, typically banded, highly fossiliferous, nodular chert. Bedded in Permian-age limestone, the lower units are less

susceptible to weathering, while the upper portions weather more readily, spilling chert detritus downslope (Haury 1981:50-51). From a cultural point of view, freshly quarried chert is a more predictable resource; that is, it is more consistently knappable than chert that has been exposed for longer periods. Early and Middle Ceramic peoples tended to exploit the chert that was already exposed and, therefore, more accessible. As demand for the resource increased in Late Ceramic times, native use shifted from the surface chert to the less weathered, subsurface cherts, which were of better quality and workability (Vehik 1986b). This switch required removal of the earth and caprock, with shallow pits being the end result (Banks 1990:96-101, Figures 5.16-5.18).

One reason for the shift from expedient usage to labor intensive quarrying apparently was a demand for Florence A after A.D. 1450, not just by local populations, but much farther afield (Vehik 1986b:142). Indeed, in a survey of sites in which the chert has been identified and reported, Cooper (1975) found it widely spread in Late Ceramic sites in central and northern Kansas, throughout Oklahoma, and even in northern Texas. Florence A is common in the artifact assemblages from the Little River sites, 14MN328, and Neodesha Fort in Wilson County, as well as in later sites in Oklahoma such as Deer Creek. The quantities in which it occurs on sites falls off markedly with distance from the source area. The mode of acquisition of Florence A, at least for the people in the Lower Walnut sites, was almost certainly direct acquisition. Trade and/or direct acquisition are both possibilities for movement of the chert throughout the central and southern plains (Cooper 1975). Vehik (1986b, 1990) argues compellingly for trade as the prime mover for the chert outside of the local area.

RESEARCH METHODS

Archeological activities within the project area involved standard pedestrian survey, occasional shovel testing and/or coring to determine whether cultural material was present in areas where ground cover was dense, and testing of deposits with both 1 x 1-m test units and machine removal of plow zone. Coring was done with an Oakfield soil probe, a hand-held device that allows removal of a 1-inch diameter core from up to a meter below the surface. Test units were hand-excavated, using shovels and trowels. Excavation was done in arbitrary 10-cm levels, and all cultural materials from each level were bagged. Every level was documented and, when necessary, photographed and/or mapped. Generally, one or two unit walls from completed units were profiled, producing a record of vertical soil changes. Test units were excavated to sterile soil. Machine removal of the plow zone employed both a tractor-drawn landscape scraper and both the large and small buckets of a backhoe.

Recovered cultural materials and the supporting documentation were returned to the KSHS Archeology Office in Topeka. In the laboratory artifacts were cleaned, catalogued, analyzed, and ultimately curated.

SURVEY AND TESTING RESULTS

The investigations within the Arkansas City Bypass right-of-way during 1992 and 1993 resulted in the recordation of four sites: 14CO385 (Radio Lane site), 14CO386, 14CO387, and 14CO392. Three of these sites--14CO385, 14CO386, and 14CO387--plus portions of the Larcom-Haggard site, were tested (Figure 2). Archeological testing at the Radio Lane site included not only conventional, hand-excavated test units but also the machine removal of plow zone in two locations. Radio Lane and Larcom-Haggard are, of course, Great Bend aspect sites. The most visible component of 14CO387 is the remnant of a historic farmstead, but less obvious traces of the Great Bend culture are present as well. Site 14CO392 is also a historic farmstead; all remains except for a foundation and a windmill are now gone. The site was outside of the highway right-of-way, and, other than archival background research, no further effort was expended on it.

Larcom-Haggard (14CO1)

The Larcom-Haggard site was first investigated by Waldo R. Wedel in 1940 (Wedel 1959) (Figure 2). He reported finding 25 to 30 features at the north end of the terrace complex

on which the site lies, west of the old river channel (now Phil McFarland's gravel quarry), and east of the Santa Fe tracks. The features included cache pits, mostly cylindrical in shape and varying in depth from 61 to 287 cm (24-113 inches), with diameters of about 61 to 190.5 cm (24-75 inches). Content varied, with some pits containing few artifacts in an earthy fill and others having abundant artifacts in ashy fill. One pit had a false bottom. Six or seven irregularly shaped areas were interpreted as middens; one such area had a depth of over 1.5 m. Significantly, two pits were found to overlap, indicating reuse of at least a portion of the site (Wedel 1959:348-349).

The area adjacent to the site on the east has since been drastically altered by the removal of vast amounts of gravel from a quarry location. Tillage of the area around the quarry and where Wedel dug has proceeded for an additional 50+ years since his historic investigations. The site, as presently defined, curls around the quarry between the Santa Fe tracks and Radio Lane (the road). The quarry extracts gravel from an old filled meander of the Walnut River. Relief is low over most of the area; elevation varies from 1,065 to 1,080 feet, with the land rising almost imperceptibly to the north and dropping abruptly along the east. In geomorphic terms the site lies mostly on the T-1, but as the elevation increases, the T-1 changes to the T-2. At the north end of the site, the landform upon which cultural remains are found may be an alluvial fan. The low area, including the quarry and the land immediately east, is the T-0 or modern floodplain.

Two areas of the site were investigated by the KSHS in 1992: the southeastern edge, which is crossed by the actual bypass, and the north end, affected mainly by a proposed flood control levee. Twelve 1 x 1-m test units were excavated. Six units were placed in the southeast portion of the site. Three units were spaced at intervals along the center line, one was located to the west of it, and the remaining two were placed east of the line. Six more units, oriented east to west, were excavated in the north end of the site. Units were aligned to test the area to be impacted by the 50-foot-wide tieback levee. As the levee was unmarked, its location was approximated from design plans. A limited amount of coring was done, mostly near unit 11. Mechanical stripping of the plow zone was ruled out because of the damage it would have caused to actively tilled fields.

In the southeastern area of the site, test units 1 through 6 revealed a generally uniform stratigraphy. With the exception of units 4 and 6, all of the units were very similar. The plow zone varied from 20 to 24 cm in thickness and was underlain by more compact subsoil. Cultural material was relatively abundant in the right-of-way area. For the most part, artifacts came from the plow zone. In most units where artifacts were present below the plow zone, but apparently still within the topsoil or A horizon, the artifacts occurred in areas of obvious rodent disturbance. In some few cases, artifacts could have migrated downward via soil desiccation cracks. Unit 5, for example, was crisscrossed by such cracks, some up to 2 cm wide. The cracks continued to the base of the unit at 30 cm below surface.

Excavation in unit 4, a unit placed relatively near the terrace escarpment, encountered a dark, almost black, clayey soil below the plow zone. This soil, which had been disturbed by plowing, was interpreted as a probable "flood drape;" that is, it represents an alluvial deposit dumped by flood waters from the former river channel. A few artifacts were found in it. The silty subsoil below it was about 10 cm thick and contained small quantities of artifacts. In fact, artifacts were found to the base of the test unit at 50 cm.

While few artifacts were recovered from sub-plow zone contexts, minute fragments of charcoal and burned earth were observed in units 1 and 6 in what appeared to be undisturbed soil. The same phenomenon was observed in nearly every unit and in many cores from nearby tested portions of 14CO385. On that site charcoal and burned earth were likely associated with the paleosol; usually cultural material was also present, though often in small amounts. Buried cultural features eventually were found when the plow zone was stripped away. The proximity of the southeastern area of 14CO1 to the investigated portion of 14CO385

suggests that the area has the potential to yield such features preserved below the plow zone.

Units 7 through 12 at the north end of 14CO1 tested the location of a proposed tie-back levee. As the flood control portion of the project is currently planned, much of 14CO1 would be used to impound water during 50 and 100 year floods. The density of cultural and noncultural material in the area, both on the surface and below it, is much less than in the southeastern part of the site. No evidence of Wedel's 1940 investigations were uncovered, and it seems probable that his work focused on an area somewhat south of where the tie-back levee crosses the site.

Virtually all of the recovered cultural material from the six test units came from the plow zone; sub-plow zone levels were sterile in terms of artifacts. Three units, 8, 9, and 11, showed traces of a darker, sub-plow zone soil. In these units a slightly darker soil layer was noticed immediately below the plow zone. The layer was only a few centimeters thick. In unit 9 flecks of burned earth and charcoal were visible, but no artifacts were found. A piece of modern bottle glass was found in the darker soil in unit 11. Perhaps this is another paleosol, albeit weakly developed or just a remnant, but the evidence is far from certain. This was the one part of the project area where no geomorphological research was conducted. However, the presence of the glass fragment suggests that the darker layer may be a remnant of an older plow zone and not a paleosol; it may even be a by-product of soil moisture. Cores taken in the vicinity of unit 11 did show the darker layer, but a core from 6 m away did not. Whatever the nature of the darker soil, it does not appear to be widespread.

Radio Lane Site (14CO385)

The Radio Lane site lies on the first terrace (T-1) of the Walnut river. It is bounded by Radio Lane, C Street Canal, Green's Farm Road, and the Santa Fe Railroad tracks (Figure 2). Topography across the approximately 40 acres of the site is characterized by low ridges and shallow swales. At the west edge of the site, the land surface rises about a meter to the second terrace (T-2). Cultural remains of the Lower Walnut focus are variably scattered across the site. During the several week period in 1992, when archeological and geomorphological studies were conducted, grass and weeds formed a dense cover. The entire area, which was field long under cultivation, had lain fallow for a season. Despite the density of ground cover, occasional artifacts were found widely distributed across the site, a fact attested to by local collectors as well.

The proposed right-of-way cuts a 300-foot-wide swathe through the eastern third of the site (Figure 8). This area was tested with eight test units: four on the center line (as nearly as could be determined), three to the west, and one to the east. In addition to test units, limited coring with an Oakfield probe and machine removal of the plow zone from two areas completed the archeological testing.

At the Radio Lane site it was possible to determine soil stratigraphy across the area tested. Information on stratigraphy came from both test units and four backhoe trenches. The geomorphic investigations were largely responsible for tying together individual unit stratigraphy into a coherent whole. From the work it is evident that the site is underlain by a paleosol. This soil appears to be more deeply buried in proximity to C Street Canal (a channelized intermittent tributary of the Walnut River) and rises almost to the present land surface at the north edge of the low rise where two cultural features were found. The paleosol represents the land surface occupied by the Great Bend aspect inhabitants of the valley.

Excavation units 1, 2, 3, 5, 6, 7, and 8 were all situated on a broad, low rise that dominates much of the southern portion of the right-of-way area; unit 4 was dug in the swale to the north of the rise (Figure 8). With the exception of unit 3, all units exhibited a relatively uniform appearance in terms of the soils. The topsoil or plow zone was a dark grayish brown silty clay loam. The subsoil, generally compact and more clayey than the plow zone, contained numerous flecks of burned earth and charcoal throughout. However, it yielded few artifacts. A series of cores taken with the Oakfield probe at intervals

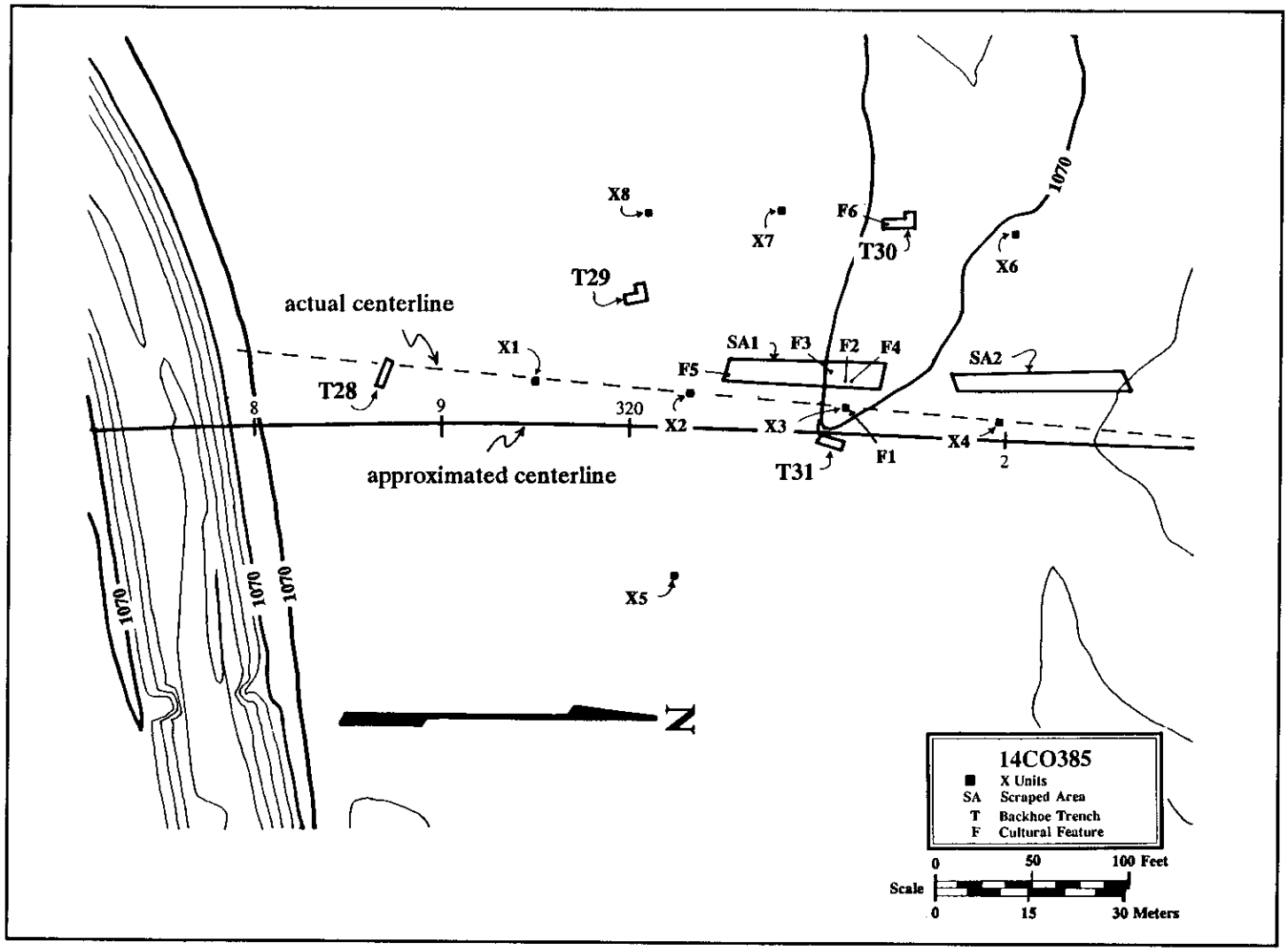

Figure 8. Map of portion of 14CO385, showing center line, test units, geomorphologic trenches, scraped areas, and cultural features. Map is from 1992 KSHS investigations.

between units 2 and 3 showed the same pattern, at least in terms of the sprinkling of burned earth and charcoal.

Test units 3 and 4 were different from the others. Test unit 3 displayed a moderately thick plow zone, which was followed by a disturbed looking, very dark grayish brown, compact clayey layer. The disturbance, apparent in the highly mottled and blocky appearance of the matrix, may have resulted from plowing. Unlike the subsoil in units 1, 2, 5, 6, 7, and 8, the disturbed soil contained moderate amounts of artifacts, such as flakes and modified flakes. Burned earth was present, as were bone fragments. A circular stain, observed at about 40 cm below the surface, proved to be a large post mold and was designated Feature 1. Cultural debris continued down to about 60 cm. In unit 4 the plow zone was thin and underlain by yellowish brown clay. Few artifacts were recovered.

Cultural features--post molds and trash-filled pits at the Radio Lane site--are present and still largely intact below the plow zone, as was clear in unit 3. Identifying features was a major goal of the investigations. At 14CO385 the units were widely spaced, and because vegetation concealed artifact concentrations, finding features was, by and large, fortuitous. To gain information on the density of features, be they posts, pits, or even structures, mechanical stripping of the plow zone was carried out (Figure 9). By this means a larger area than could reasonably be opened by hand in a time-efficient manner was explored. Accordingly, two areas of the Radio Lane site, designated Scraped Areas 1 and 2 (Figure 8), were stripped of plow zone by both a tractor-drawn landscape scraper and a backhoe. The overall depth of Scraped Area 1 was about 30 cm, the approximate base of the plow zone. Scraped Area 2, located on the edge of the swale, went slightly deeper to about 35 cm. Both areas were closely monitored during scraping, and a sizeable collection of artifacts was made from Scraped Area 1. The number of artifacts suggests a rather dense concentration of materials on the ridge. Artifacts were not as prevalent in Scraped Area 2.

Figure 9. Crew members monitor the mechanical stripping of the plow zone at 14CO385.

Features 2, 3, 4, and 5 were identified in Scraped Area 1; no features were found in Scraped Area 2. Features 2, 3, and 4 were tightly clustered together (Figure 8). Feature 1 was located in the same general area. Another pit, Feature 6, was found accidently in Trench 30, a trench dug during the geomorphic investigations. The feature was truncated by the backhoe, but probably more than half of it was salvageable. With the exception of Features 1 and 6, features were not excavated, only defined in plan view. This procedure was stipulated in early discussions with the Corps of Engineers and KDOT (Hawley et al. 1994).

Feature 1 was a large post mold. Uncovered in unit 3, the feature was first noted at 40 cm below the surface. When cross sectioned, the feature was found to have slightly tapered sides, ending in a rounded base at 1 m below the surface. The fill was very dark grayish brown, friable silty loam with charcoal and burned earth flecking. The post would seem to suggest a structure. However, its size was greater by a substantial margin than posts reported in other Great Bend houses in Kansas. The post features at 14MN328, for instance, ranged from 9 to 17 cm in diameter and from 7 to 19 cm in depth (Lees et al. 1989:47, Table 1). Feature 1 was 18 cm in diameter and at least 60 cm deep. John D. Reynolds (personal communication, 1993)

suggested that it could be one of several big posts for some type of large arbor structure.

Feature 2 in Scraped Area 1 showed in plan view as an oval, light yellowish brown stain against the darker subsoil. The long axis of the oval, which measured 102 cm, was oriented east to west. The stain was 85 cm wide. Within the stain were numerous flakes, core fragments, shatter, burned and unburned limestone, small burned earth nodules, and a small modified limestone slab. Some fragments of highly friable bone were also observed but rapidly deteriorated upon contact with air. The feature was cored, and bone and flakes were present 60 to 90 cm below the pre-stripped ground surface. The feature seemed to be a shallow pit; it did not appear to be densely filled.

Feature 3 was indicated, not by a stain or soil discoloration, but by several large pieces of bison bone and a few flakes concentrated together in Scraped Area 1 (Figure 10). The area around the bone was cleaned down and away from the bone on the east side of the concentration. A slight color change finally was noticed along the northeastern periphery of the bone mass, but it was not certain if this was the edge of a pit. A few additional pieces of bone were found about 1 to 1.5 m west of the main mass of bone. If these were part of the main concentration, then a pit or basin with an orifice diameter of almost 2 m was indicated. Cores revealed bone another 20 to 30 cm below the stripped surface. The dimensions of the pit, if that is what the cluster of bone represents, were not discernible.

Figure 10. Bone mass, indicating the top of Feature 3 at 14CO385.

Feature 4 was an irregular, roughly circular concentration of burned earth and charcoal. The feature had a diameter of about 90 cm. The soil was very dark grayish brown to black and had a "greasy" feel to it. Two plow scars had damaged the stain. The area was probed, the cores showing the same blackish fill to an additional 10 cm in depth. It was unclear if this stain represented a hearth, a pit orifice, or some sort of shallow basin. No artifacts, bone, or other material were apparent in it.

Feature 5 initially appeared to be a similar stain, but once the area was carefully troweled, it was found to be a series of amorphous blackish splotches. Further work was curtailed, as it no longer seemed to be a cultural feature.

Feature 6, damaged during excavation of Trench 30, was completely dug (Figure 11). The feature proved to be a small, shallow, slightly flaring pit. The pit was probably circular in plan view with a diameter at the top of about 82 cm and at the base of 90 cm. The feature was approximately 30 cm deep, although as much as an another 10 cm may have been inadvertently destroyed. Its fill contained nearly 7,500 flakes, numerous modified flakes, projectile point fragments, three large heat-shattered bifaces, other tools, and three potsherds. Bone included a modified deer metapodial and a turtle carapace. Many of the largest flakes, as well as the deer metapodial and turtle shell, were from the center of the pit floor. Charcoal and burned earth flecks were plentiful throughout the fill. The contents of the pit were varied but dominated by chipped stone debris. The preponderance of lithic material brings to mind a similar pit found at the nearby Larcom-Haggard site. The pit there "contained a tightly packed fill of thousands of flint chips, most pink forminiferal chert, two knives, a scraper, and a few bone fragments" (Wedel 1959:349). The pit had dimensions similar to that at the Radio

Figure 11. View of Feature 6 at 14CO385, showing turtle carapace, deer metapodial, and thick biface fragments.

Lane site. The feature was interpreted as a cache of raw materials or a flintknapper's waste dump.

The potential for some type of structures, including houses, is very real for the area despite the negative results of testing. Thies (1991a) reported a possible pithouse from 14CO102, which is only about 1,500 feet to the east. Wedel (1959:349-351) suspected that his crew had found a pithouse at the Elliott site but was unable to determine a post pattern. Conceivably, one or more of the deep, irregular midden areas investigated by Wedel (1959:349) northeast of Radio Lane on the Larcom-Haggard site could represent pithouse remains (William B. Lees, personal communication, 1993). Lees et al. (1989:104) found both a pithouse and a surface house at 14MN328. The two structures are believed to be roughly contemporaneous, so either or both types could be present in the project area sites.

Two dates were secured from charcoal from the possible house at 14CO102: 1560 ± 125 and 1700 ± 65. The two dates, which have overlapping plus or minus values, suggest a maximum age range of A.D. 1435 to 1765. The end of this range seems too late, considering that there has been no evidence of historic materials from 14CO102, Radio Lane, or any of the Lower Walnut sites. Deer Creek and Bryson-Paddock both contained substantial quantities of historic goods.

Subsequent to the KSHS testing of the Radio Lane site and Wichita State University's work at 14CO1509 (a Great Bend site south of C Street Canal and north of Kansas Avenue), unknown person or persons "potted" portions of both sites. Potholes were reported by the tenant and, from his description, appear to have been in the vicinity of the features delineated at 14CO385 and in a scraped area of 14CO1509 where no features were reported. It is not yet known if the looting was successful in penetrating pit features at the Radio Lane site. Regrettably, archeological investigations, while raising awareness in some, simply spur others to such acts of vandalism. Every archeological site is unique, fragile, and, of course, utterly irreplaceable. Archeological investigations are inherently destructive, but in a sense sites are preserved by the information that is saved; this is not the case with potting or looting.

14CO386

Site 14CO386 lies immediately north of North Creek (Figure 2). Surface material was thinly scattered over the 8 to 10 acres of the site. Most material is from the lower portion of the site (the T-1), but some flakes were found on the slopes ascending to a protected remnant of T-3. Elevation varies from about 1,070 to 1,090 feet. Tillage has affected the area, as the higher elevations of the site appear to be somewhat deflated, while the T-1 evidently is blanketed by slope wash and so-called post-settlement alluvium (settlement referring to Euro-American settlement).

Subsurface investigations within the right-of-way were made by five 1 x 1-m test units; three were excavated on the higher surface, and two were dug into the T-1. Test excavations revealed little. Two flakes were recovered from unit 1 in the T-1, with an additional six being found in units 4 and 5 on the higher ground. All of this material was in the plow zone. Cores and a cutbank exposure suggested that a buried soil

might be present. At a depth of 65 to 80 cm below the surface, a darker band of soil was noted. This soil contained, once again, minute fragments of burned earth and clay. No artifacts were observed, although there was a chunk of limestone at a depth of 60 cm below the surface.

14CO387

Located near the intersection of Madison Avenue and Mill Road, 14CO387 consists of a diffuse prehistoric scatter of chipped stone debris and a much denser historic component (Figure 2). The prehistoric expression of the site is found both on an elevated, broad, flat surface (the T-1 or first terrace) and down a north-facing slope. The slope appears to be part of a swale, probably the headwaters of a small and now heavily channelized intermittent tributary of the Walnut River. The historic component is located primarily on the higher flat surface, and considerable quantities of historic debris litter the area. The overall area that encompasses both components is approximately 2 acres. The Walnut River lies to the east about 1,200 feet. Except for the trees, brush, grass, and weeds in proximity to the buildings, the site area has been cultivated for many years.

The historic artifacts recovered from the surface and test units indicated a rather broad time span for the Euro-American component, ranging from the 1890s into the 1970s. Archival research tends to support the long time span, although there is no evidence in the documentary record to suggest that any buildings were there prior to 1905. Two small dilapidated sheds are still present, but the house and barn that once stood on the location were razed, and the remains of their foundations were bulldozed out of the way.

The prehistoric component, while not yielding any diagnostic artifacts, nonetheless is probably assignable to the Great Bend aspect. The surface scatter, consisting mostly of flakes, was light. Excavation of eight 1 x 1-m test units, hand coring with an Oakfield probe, and shovel testing produced few additional artifacts. Geomorphological investigations, conducted concurrently with archeological testing, revealed that both the high and low surfaces were underlain by buried soils or paleosols. Both soils were covered by about 65 cm of recently deposited sediments. Humic matter in the soil in the T-1 (high surface) yielded a date of about 2270 ± 140 B.P. (circa 270 B.C.). The date indicates that the landform was stable from the end of the Archaic through the Historic period. Four test units, dug deep enough to penetrate this soil, failed to recover even a single artifact, other than a piece of heated sandstone. No date was obtained from the soil buried under the T-0 (low surface), which is likely a terrace associated more with the intermittent channel than with either the Walnut or Arkansas rivers. Two 1 x 1-m units were set up to test this second paleosol for cultural remains. Other than occasional minute fragments of burned earth and a small piece of rotted bone, nothing of any significance was encountered.

14CO392

Site 14CO392 is the designation for the remains of a historic farmstead (Figure 2). Situated on the T-1 on the south side of North Creek, the site has an elevation of 1,069 feet. The site includes a poured concrete foundation, apparently of a house, a windmill, and a light scattering of artifacts, including a few prehistoric items. Site occupation began in the late 1870s and ended abruptly in April 1944, when the area was flooded. The farm was sold that same month, and the house was moved to higher ground across the creek.

The surface collection of artifacts consists of a rusted railroad spike, bottle glass, white glass canning jar lid fragments, and some stoneware and whiteware vessel fragments. The materials indicate a temporal range from the 1890s to the 1930s, dates that are generally consistent with the results obtained from archival research. Artifactual material was not abundant on the surface. Quite possibly the area is covered with recently deposited alluvium that is obscuring artifacts and other site details.

Other Sites

In addition to the Larcom-Haggard and Radio Lane sites, three other major Great Bend sites will be adversely affected by the proposed

bypass: 14CO332, 14CO501, and 14CO1509. Also impacted by the new highway will be 14CO1510, a site with historic and prehistoric components, and 14CO104, a historic site. Site 14CO382, a Great Bend site partially within the path of the upgrade of U.S. Highway 166, was initially included within a proposed borrow area. Following geomorphic testing, however, the boundaries of the borrow area were altered to exclude it. Sites 14CO501, 14CO1509, 14CO1510, and 14CO104 were studied by Wichita State University archeologists under separate contract with the Corps of Engineers in 1992 (Figure 2). Information on the results of survey and testing was provided by Arthur H. Rohn of that institution.

Site 14CO332, a Great Bend site which lies on the T-2 landform, was surveyed and tested in 1990 by Thies (1991a:18) (Figure 2). Subsequent to the investigations,

> KSHS archeologists received notice that "bones were coming up from four feet down" in a new Conoco jet fuel pipeline. Since the finders were unsure as to whether or not the bone was human, immediate attention was warranted. . . .
>
> The find was not a human burial. . . [but] was determined to be a trash-filled storage pit of Great Bend cultural affiliation. All of the feature was thereupon removed by careful excavation. Although most of the upper and eastern portions of the pit had been removed by the backhoe, enough remained to permit its dimensions to be defined. It was a bell-shaped pit with a basal diameter of 120 cm. The feature extended to a depth of 145 cm below the present-day ground surface, with a neck that apparently extended to 35 cm below surface. The contents of the pit consisted of habitational debris, including charcoal, burned earth, and bison bone in addition to pottery, and tools made of chipped stone, ground stone, and bone. The charcoal was of a sufficient amount as to allow for radiocarbon dating, the funding for which [was] provided by Conoco.
>
> The find was in an area which had been heavily tested by soil core probing and test pit excavation during the 1990 investigation. The abundance of artifacts in that part of the field clearly indicated habitation. . .(Thies 1991a:18).

The pottery from the pit includes a reconstructible vessel. Shell-tempered, the vessel is sub-conical in form and has a straight rim. The rim is decorated with four equally spaced sets of four scallops (Figure 12). The vessel has walls as thin as 1.9 mm. The base of the pot is rounded. The radiocarbon assay from charcoal puts the date for the pit at A.D. 1600 ± 80.

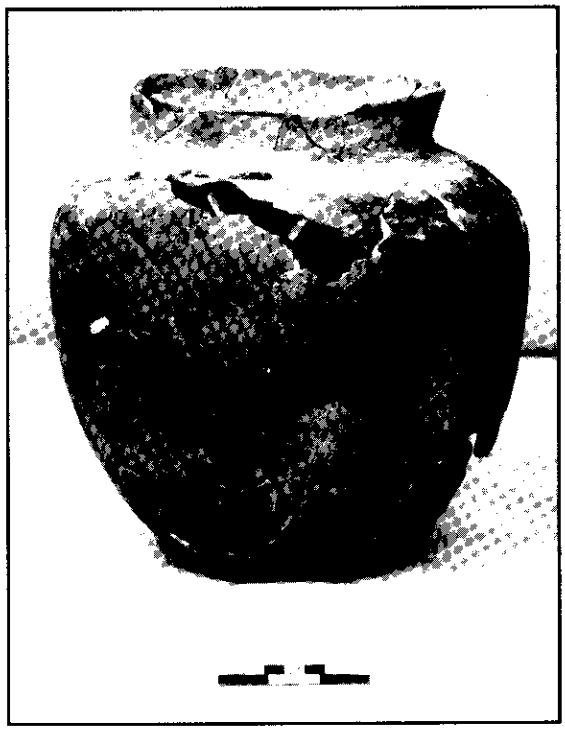

Figure 12. Reconstructed Cowley Plain vessel from 14CO332.

Site 14CO501 lies on the T-2 and T-1 south of Poplar Avenue (Figure 2). Several artifact concentrations were identified, and several test units were excavated within the right-of-way. The units indicated that most of the material was within the plow zone, although limited quantities

of artifacts were recovered below the plow zone. As with the KSHS testing at the Radio Lane site, two areas were stripped using a backhoe. Four pit features were identified in one of the two areas as a result. The features were completely excavated and turned out to be relatively small, cylindrical storage pits. Feature 1 was an oval pit, measuring 84 cm east-west by 63 cm north-south and 18 cm deep. Feature 2 had a diameter of 74 cm and a maximum depth to its base of 94 cm below surface. The scraped area was 50 cm deep in that location. Feature 3 had a diameter of 80 to 85 cm; depth to its base was 60 cm below the surface. The feature was first noted at 40 cm below surface. Feature 4 was 110 cm north-south by 94 cm east-west and had a depth of 18 to 20 cm below the scraped area. All of the pits yielded artifacts. Feature 2 produced a reconstructible Cowley Plain vessel, a stone maul, and five bison scapula hoes. While prepared as hoes, none of the scapulae actually seem to have been used.

Site 14CO1509 is situated on both the T-2 and T-1 terraces (Figure 2). The site, which lies south of C Street Canal and north of Kansas Avenue, was also investigated by WSU in 1992. The site boundaries were conservatively defined as vegetation cover obscured much of the area, just as it did at the Radio Lane site. Only one artifact concentration was discernible. Test units and shovel tests indicated that the material was confined to the plow zone. Two areas were scraped in an attempt to locate features but without success. The possibility that pits and other features exist within the right-of-way at 14CO1509 is considered to be very strong, however. KSHS archeologists recovered an obsidian flake from the surface of this site in 1992. Obsidian is present but comparatively rare in the Walnut River valley (O'Bryant 1947:147; Wedel 1959:367-368). The material is much more common in the central Kansas Great Bend aspect sites.

Located near the existing levee, 14CO1510 has two components: historic Euro-American and Great Bend aspect. The site lies on a natural levee on the T-0 or modern floodplain (Figure 2). The historic component, a farmstead, has been bulldozed, and all that remains are piles of weed-choked rubble. The lone remaining structure is a windmill. Related domestic trash--glass, crockery, whiteware, nails, etc.--are strewn about the area. Among the historic debris evidence of an earlier component was found: a shell hoe and a stone mano. Further scrutiny revealed additional material, all pointing to the Great Bend aspect. One area was scraped, and a backhoe trench was excavated. The work suggested that much of the site was so heavily disturbed as to be destroyed.

The final site visited by WSU archeologists is 14CO104 (Figure 2). Previously recorded, the site is of Euro-American origin. Possibly a dump, the site does not appear to merit any further activity.

Three backhoe trenches were excavated into the southern portion of 14CO382 (Figure 2). This site, located on the T-1 and T-2, was defined during the initial phase of investigations for the upgrade of U.S. 166 (Hawley et al. 1993). The trenches did reveal artifactual materials intact well below the plow zone. A small sample of artifacts, including flakes, a modified flake, and a thin biface fragment, were collected. The material is not diagnostic; despite this, it is a safe bet that it is attributable to the Lower Walnut focus.

RECOVERED MATERIAL

Time is the enemy of the works of humankind. The tangible evidence of past cultures represents a vanishingly small portion of actual past material cultures. With the disappearance of perishables goes voluminous information on prehistoric behavior. Except in the comparatively rare instances of freezing, waterlogging, desiccation, or charring, most things simply do not survive. Archeologists are constrained to interpret sites and their functions on the basis of what little does preserve: stone, pottery, perhaps bone, and bits of charred material. Etzanoa, possibly the village complex near Arkansas City, was a place fairly teeming with activity and filled with a variety and wealth of artifacts. Very little of that richness now remains.

The materials recovered from the sites during this project are not abundant. They

include chipped stone tools, chipped stone debris, pottery sherds, and smaller amounts of ground stone, unmodified and modified bone. None of the bone is human.

CHIPPED STONE

The raw materials for the stone tools in the assemblages from sites in the project area are not terribly diverse and certainly are more limited than collections from other Great Bend aspect sites. The chert types in the collections are, for the most part, of relatively local origins; only occasional pieces found to date are more "exotic" stone. Local cherts include Florence A or Kay County chert, which dominates the collections, and minor quantities of gray Permian chert, which outcrops in the nearby Flint Hills and can be found as river cobbles. Other stone includes Tahlequah, Smoky Hill jasper or Niobrarite, Alibates agatized dolomite, some types of Mississippian cherts, and cherts that could not be positively identified. A single flake of obsidian was retrieved from the surface of 14CO1509 (Figure 13).

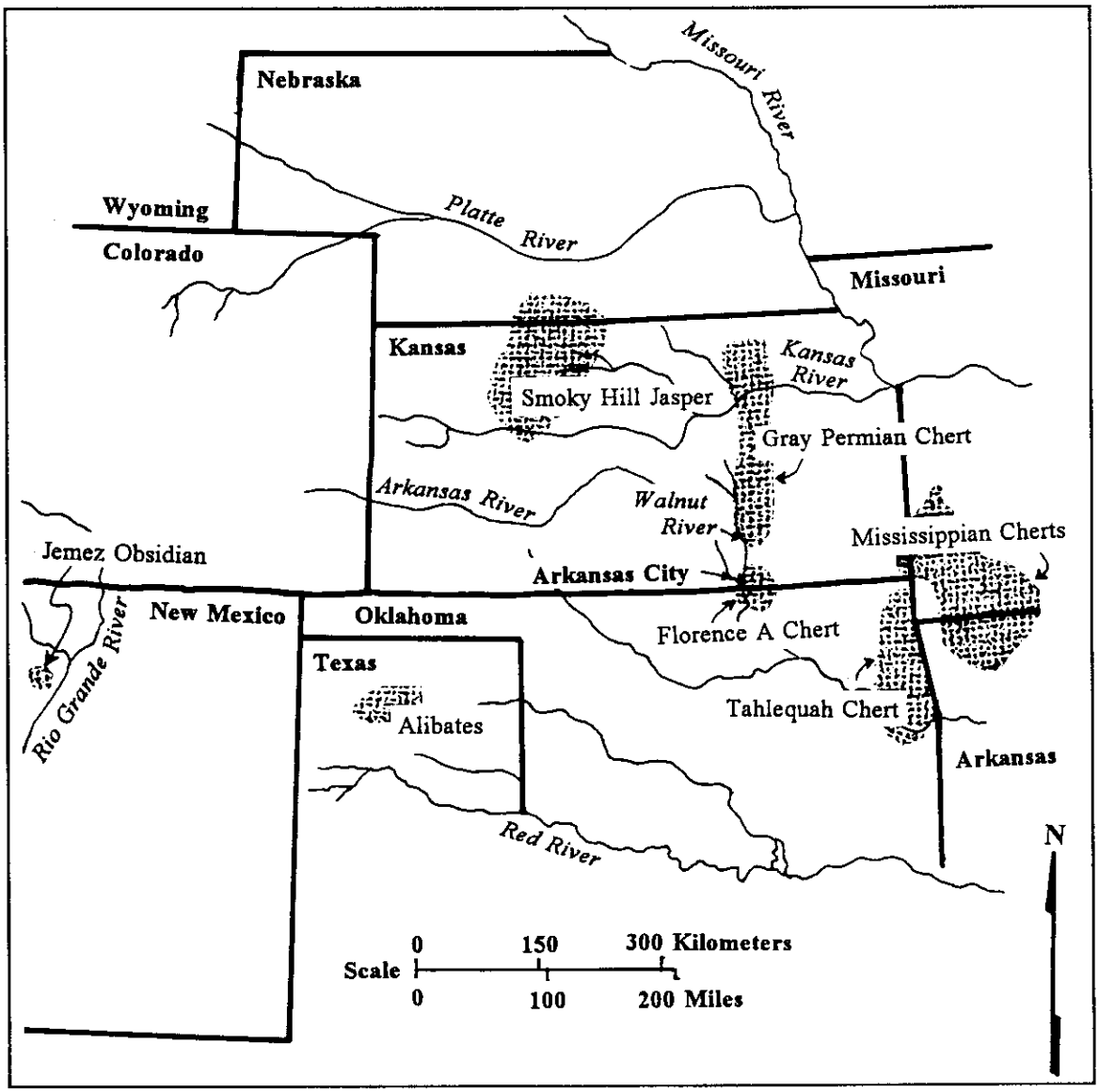

Figure 13. Regional map, showing source areas of chipped stone from Lower Walnut focus sites.

Florence A or Kay County chert is a distinctively banded, mottled, or speckled chert that ranges in color from light gray to brownish yellow. It is rich in completely silicified forminifera and gastropod fossils. The chert is found in nodules or nodular lenses (Haury 1981:50). In fact, Banks (1984:77) has observed that the chert's tendency to occur as relatively wide and flat nodules makes it unique among Flint Hills cherts. The natural shape of the nodules readily suits it to the production of medium to large bifaces. Florence A responds extremely well to heat treatment and typically exhibits color changes to red hues when it is so treated. The precise limits of the chert are unknown but include major surface and near-surface concentrations in Kay County, Oklahoma, and Cowley County, Kansas (Figure 13).

Other varieties of more northerly Flint Hills cherts include Foraker, Wreford, and other Florence types, herein called "gray Permian" (Figure 13). Although some of the other varieties are of good quality, in general terms the other Flint Hills types are inferior to Florence A. In particular, the cherts do not respond as well to thermal alteration and experimentally heat-treated specimens often exhibit no discernible color changes. Chert colors normally range from blue to dark blue-gray and many have fossil inclusions, which may or may not be silicified. Textures range from fine to coarse, depending on the type and other factors, such as degree of weathering.

Tahlequah chert, sometimes referred to as Peoria chert because of the well-known prehistoric quarries near Peoria, Ottawa County, Oklahoma (Holmes 1894, 1919), is a distinctive and somewhat coarse-grained white chert of Mississippian age (Banks 1984) (Figure 13). The chert responds well to heating and normally exhibits color changes from white or grayish white to red hues. In its unaltered state Tahlequah tends to be intractable, but when properly heated, the material becomes much more responsive to knapping.

Tahlequah is not the only Mississippian chert to occur in the collections from the Arkansas City sites; small quantities of other Mississippian-age cherts of uncertain types are present. In all probability the cherts, which tend to be fine-grained, generally glossy (heated?), and white to grayish white to pink, are from the east, perhaps the Ozark Plateau region of extreme southeastern Kansas, southern Missouri, and Arkansas (Figure 13). Mississippian cherts tend to respond well to heating and often display observable changes as a result (Ray 1982).

A minor type of stone in the Arkansas City site assemblages, Smoky Hill jasper is a distinctive, often banded form of agatized chalky marl that outcrops in northwestern Kansas and adjacent areas of Nebraska (Wright 1985:87) (Figure 13). Texture ranges from coarse and chalky to very fine on highly silicified specimens. Usually it occurs as relatively thin plates, embedded within Smoky Hill chalk. It manifests a range of colors from hues of yellow, brown, green, red, and even white.

Another minor stone type is Alibates agatized dolomite, a highly siliceous microcrystalline quartz. The principal source of the material is in the Texas Panhandle, just north of Amarillo (Figure 13), although size-graded alluvial deposits of it have been reported as far east as Arkansas (Lintz 1984:335). Extensive aboriginal quarries, many presumed to date from the Late Prehistoric period, are found in the Amarillo area (Hofman 1984:355). Alibates is distinguished by colorful bands, swirls, and speckling of reds and whites, with occasional blues, purples, grays, and maroons represented (Wallis 1980:12).

Obsidian is found in trace quantities in the Lower Walnut focus sites at Arkansas City (Wedel 1959:367-368; O'Bryant 1947:147). Obsidian occurring in Late Ceramic sites in the Southern Plains is most likely from deposits in the Jemez Mountains of New Mexico (Figure 13). Only one piece of obsidian, a flake, was recovered in the project area during the 1992/1993 investigations.

Thermal Alteration

The sample of chipped stone tools and debitage from the sites reveals that thermal alteration, much of it likely intentional, is

common. Thermal alteration of chert, when purposefully done, is referred to as heat treatment. Heat treatment was a technique used by prehistoric peoples to improve the workability of chert, often producing color and texture changes as well. Successful heating can greatly improve stone. Heating failures, of which there are some classic examples from the Radio Lane site, are indicated by these same characteristics, but specimens also exhibit either pot-lid fractures from being heated too quickly or cracked and crenated fractures from too rapid cooling (Purdy 1975).

Heat treatment was not universally applied by ancient flintknappers. Some types of stone are readily workable and, hence, require no efforts to improve them. Other types of stone, such as Smoky Hill jasper, crack and craze when heated and actually become less usable. Florence A chert is particularly susceptible to heating and, consequently, is often found in its thermally altered state.

Debitage and Tools

Although the sites in the valley are all attributable to Lower Walnut Great Bend, the discussion of chipped stone debitage and tools will proceed by site.

Larcom-Haggard Site (14CO1)

The sample of debitage from the Larcom-Haggard site totals 555 specimens. Less than half (n=254, 45.8 percent) are large enough for positive identification. Debitage types from the site include unidirectional and multidirectional cores, flakes--both cortical and noncortical, and shatter. Cortical flakes and shatter represent less than 2 percent of the readily identifiable material, while noncortical material constitutes nearly 40 percent of identifiable sample. The majority (n=209, 82.3 percent) are comprised of Florence A chert. The site collection also contains specimens of gray Permian chert (n=4, .7 percent), Tahlequah (n=2, .4 percent), and Mississippian chert (n=7, 1.3 percent). Unidentified cherts total another six pieces (1.1 percent) of debitage.

Thermal alteration of debitage is common. Heat treated cherts dominate almost every debitage type, except multidirectional cores (actually core fragments). Three unheated core fragments probably represent additional trimming of chert after trimmed cores had already been brought onto the site. Florence A generally appears in the collection in heat-treated form; nearly 90 percent of the Florence A in the site collection has been heated, either successfully or unsuccessfully.

Tools from the site include a variety of forms: 182 modified flakes, 12 endscrapers, 1 sidescraper, 5 thick and 3 thin bifaces, 2 beveled knife fragments, 17 unnotched triangular points, 1 side-notched triangular point, 1 reworked tool form, and 2 indeterminate drill sections. Altogether formal and informal tools total 230. Modified flakes comprise the single largest category with 182 specimens. By stone type, 170 (93.4 percent) of the 182 are made from Florence A. The rest of the modified flakes are about evenly divided among gray Permian (n=3), Tahlequah (n=5), Mississippian (n=2), and unidentified stone types (n=2). Ninety-three percent (n=214) of the tools are manufactured from Florence A chert, and of those 191 (89.3 percent) have been heated. Heating of stone is evident in all categories, and only a few tools have not been heated. For the most part heat treatment appears to have been successful, though there are some obvious failures. The gray Permian cherts generally show no signs of heating; none of the Tahlequah was heated.

Complete tools from the site are sparse. The size and weight ranges are limited as a result. Of the 182 modified flakes, 27 are whole. Size ranges for the complete artifacts are 9.64 to 62.85 mm in length, 8.38 to 43.25 mm in width, and 2.11 to 21.97 mm in thickness. Weight ranges from .2 g to 63.8 g. Twelve endscrapers are represented in the collection, and only three are complete. Length ranges from 31.47 to 37.29 mm; width, from 19.55 to 20.38 mm; and thickness, from 5.57 to 6.70 mm. Weight varies from 3.2 to 5.2 g. The one sidescraper is 29.01 mm long, 14.87 mm wide, and 5.47 mm thick and weighs 2.5 g. There are two complete thick

bifaces out of the five artifacts so classified. These specimens are 108.83 mm and 66.45 mm in length, 62.29 mm and 72.15 mm in width, 31.11 mm and 37.34 mm in thickness, and 255.4 g and 220.7 g in weight, respectively. The smaller of the two thick bifaces is similar to one illustrated by Wedel (1959:372, Figure 74c). While it is made from some type of gray Permian chert in the form of a river cobble, the larger is made from Tahlequah. The reworked tool from the site, a biface fragment modified into an endscraper, is 45.34 mm long, 27.89 mm wide, and 9.80 mm thick; it weighs 13.6 g. There are no complete thin bifaces, arrowpoints, beveled knives, or drills.

All of the tools from the site are from the plow zone. While it is possible that many tools were broken during their use-lives, it is as likely that a century of agricultural activity has significantly contributed to the number of broken artifacts recovered.

Radio Lane Site (14CO385)

The total number of pieces of debitage from 14CO385 is 9,430. This number includes all flakes, shatter, chunks, cores, and core fragments. Only 1,714 pieces (18.2 percent) are identifiable as to stone type. The remainder constitute the expected small scale debris that normally accompanies bifacial and unifacial tool production. Florence A chert accounts for 96.8 percent (n=1,660) of the identifiable debitage. Additional cherts in the collection include gray Permian (n=20,.1.2 percent), Tahlequah (n=2, .1 percent), Smoky Hill jasper (n=1, .05 percent), and Mississippian cherts (n=4, .2 percent). Unidentified chert types total an additional 23 pieces (1.3 percent) of debitage.

Intentional heating is evident in all categories; in fact, heat-treated chert (either successfully or unsuccessfully) dominates all debitage categories where identification was attempted. Even cortical flakes, which make up a small portion (.6 percent) of the debitage, have been heated. Florence A was typically heated; of the 1,660 pieces in the assemblage, 1,372 (82.7 percent) show evidence of heating. Sixteen of the 20 pieces of debitage of the other Permian varieties seem to show signs of thermal alteration or at least attempts at it. Three of the four pieces of Mississippian chert appear to have been heated, while the Smoky Hill jasper flake is untreated.

In terms of tools, the break down for chert types is similar to that for the debitage. Florence A chert comprises the raw material for 373 (92.6 percent) of the 403 tools. Tools recovered from the site include 348 modified flakes, 8 endscrapers, 1 sidescraper, 6 thick and 10 thin bifaces, 1 beveled knife, 1 expanding base irregularly shaped drill, 12 unnotched and 7 side-notched triangular arrowpoints (Figure 14a), 6 indeterminate point fragments, 3 drill fragments, and 2 hammerstones.

Determination of size ranges for tools is limited by the low numbers of complete specimens. Out of the 348 modified flakes, 47 were judged complete. For this sample the range in thickness is 9.96 mm to 61.94 mm, in width is 9.82 to 57.90 mm, in thickness is 1.60 to 17.14 mm, and in weight is .2 to 30.9 g. Size ranges for the five complete endscrapers are 22.13 to 38.49 mm in length, 17.10 to 21.08 mm in width, 4.92 to 9.05 mm in thickness, and 2.3 to 7.5 g in weight. The sidescraper has a length of 49.74 mm, width of 22.38 mm, thickness of 6.15 mm, and weight of 7.3 g. Only one side-notched point of the seven in the collection is complete. It is 16.64 mm long, 14.13 mm wide, and 3.10 mm thick and weighs .5 g. Three of the 12 unnotched, triangular points are complete. The range of length for these is 17.67 to 23.61 mm; of width, 9.17 to 16.32 mm; of thickness, 2.31 to 2.97 mm; and of weight, .3 to .7 g. The two hammerstones are both stream cobbles; the hammerstones are 91.26 mm and 70.86 mm in length, 61.11 mm and 58.12 mm in width, 46.26 mm and 43.53 mm in thickness, and 248.6 g and 183.6 g in weight, respectively. There are no complete thin or thick bifaces, beveled knives (even fragments of which are scarce), or drills.

Intentional treatment is apparent in the number of tools and amount of debitage that show signs of heating. Heat treatment was applied to the cherts of virtually all of the formal tools and most of the expediency tools. Heated tools number 334 (82.8 percent). Formal tools account for 87 (21.6 percent) of the heated,

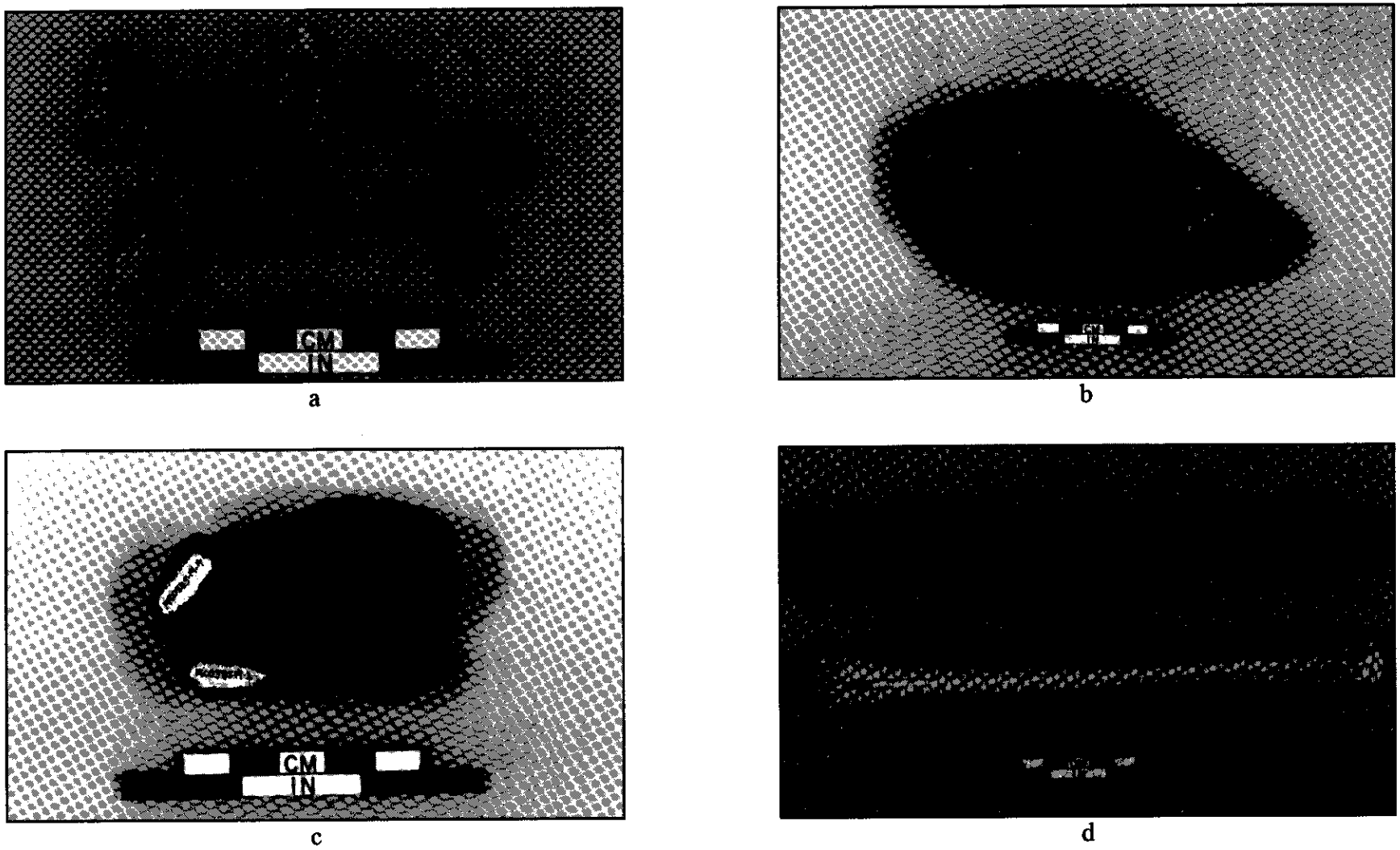

Figure 14. a) Unnotched arrowpoints from 14CO385; b) large (thick) biface, damaged during heat treatment process, from 14CO385; c) sandstone abrader from 14CO385, and d) top--modified deer metapodial from Feature 6 at 14CO385 and bottom--modern, unmodified specimen.

including apparently overheated, specimens. By chert type 351 (87.1 percent) formal and expediency tools are made from heated Florence A. Of some interest are three large, thick bifaces and trimmed nodules recovered from Feature 6 (Figure 14b). Two of the bifaces have been shaped into clearly recognizable bifacial forms, while a third is less shaped and even retains some cortical material on one lateral margin. These are not unique to this Great Bend aspect collection. Wedel (1959:Plate 46) reports large (thick) bifaces from other Great Bend sites in central Kansas; notably the specimens illustrated there are made of Florence A. Heating of the three specimens from the Radio Lane site was unsuccessful; all show definite crenation fractures, a type of fracture produced by too rapid cooling (Purdy 1975). Possibly, in one case almost certainly, the cores at first appeared to have been successfully altered. However, once attempts were made to knap the material, the affects of premature cooling became quickly apparent, the bifaces shattering along heat-induced lines of stress (Figure 14b).

Distribution and breakage patterns are apparent for some of the materials in the lithic collection. Perhaps the most striking figure is that of 19 arrowpoints from the site, 14 (73.8 percent) came from Feature 6. One unnotched triangular arrowpoint was complete, and there were seven base or edge fragments, clearly indicative of unnotched triangular forms, and six distal (tip) fragments of indeterminate type. The same feature also produced the 3 large, thick, heat-shattered bifaces, 1 sidescraper, 1 thin biface fragment, and 40 modified flakes, only 6 of which were whole. Although no flintknapper's abraders were found in association, it is conceivable that some of the apparent utilization on a number of the modified flakes is nothing more than preparation of platform striking surfaces. Flintknappers often intentionally abrade platforms with sandstone or other coarse-grained stone to weaken the chert and roughen the surface to reduce the chance that the percussor or pressure flaker will slip when the stone is impacted. All of the material from Feature 6 seems to point to a flintknapper's cache or, perhaps more likely, a specially prepared discard area associated with flintknapping. Wedel (1959:349) reported a pit with similar contents, and it is possible that there was a type of pit associated with this particular activity.

Breakage in the rest of the collection cannot be attributed with any degree of confidence to manufacturing mishaps or breakage during use. The material came from the plow zone, and so any damage observed could be due to a century of tillage.

14CO386

This small collection from a small site is very diverse in terms of raw material types. Debitage from the surface and test units totals only 55 pieces, 38 (69.1 percent) of which were considered identifiable. Twenty-five artifacts in the sample are made from Florence A chert; this is only 45.5 percent of the collection. Gray Permian cherts (n=2, 3.6 percent), Mississippian cherts (n=5, 9.0 percent), and Alibates agate (n=1, 1.8 percent), as well as 22 pieces (40.0 percent) of unidentified chert, comprise the non-Florence A debitage.

Cortical and non-cortical material all show signs of heat treatment, though there are a few items which have not been heated. All Florence A debitage (100 percent) has been heated, as have apparently the gray Permian types, though this is somewhat uncertain. The Mississippian cherts all appear to have been heated. The Alibates has not been; heating is not suspected for the unidentified chert types either.

There are only 10 tools from the site: 7 modified flakes, 1 thick biface, and 2 unnotched triangular arrowpoints. The diversity of raw materials in the tools is not as marked as it was for the debitage. Eight (80.0 percent) of the tools, including the biface, one point, and six of the seven modified flakes, are made from Florence A. The other point is Smoky Hill jasper. All of the modified flakes were heated, as were the Florence A point and the biface. All told, 90 percent of the tools had been

thermally altered. The complete jasper arrowpoint is 16.51 mm long, 13.23 mm wide, and 2.55 mm thick, and weighs .4 g. The remainder of the tools from the site have been broken, either in prehistory or in modern times by agricultural activities.

14CO387

The total number of pieces of debitage from the rather thin prehistoric component of this site is eight. Three flakes were too small for identification of the chert. Remaining are two core fragments, a cortical flake, and two non-cortical flakes. One core and all of the flakes are Florence A. The remaining core is a river pebble and so is some type of Flint Hills chert. Three of the five pieces of Florence A, including a core, have been heated.

Stone tools are in short supply at 14CO387. The four tools from the site consist of an edge fragment of a beveled knife and three modified flakes. All four are manufactured from heated Florence A chert. Only one of the four tools, a modified flake, is complete.

GROUND STONE TOOLS

Native Americans employed types of stone other than chert, such as limestone, sandstone, orthoquartzite, and quartzite, for grinding tools suited to a variety of tasks. Ground stone tools are a recognized component of Great Bend aspect assemblages reported, for instance, from the Marion sites (Lees et al. 1989) and from sites in Rice, McPherson, and Cowley counties (Wedel 1959).

The sample of ground stone from the project area sites is rather small. Only two of the sites, 14CO385 and 14CO1, produced ground stone, mostly in fragmentary form. There were nine specimens identifiable as ground stone from the Radio Lane site and only one from the Larcom-Haggard site. The item from 14CO1 was a surface find, while those from 14CO385 were found during excavations. The specimens from the Radio Lane site include an irregularly shaped abrader, seven fragments of possible manos (often called handstones) or other abraders, and a tabular limestone slab. The single ground stone artifact from 14CO1 is also possibly a handstone. The specimen from 14CO1 and one piece from 14CO385 appear to be made of silicified sandstone or orthoquartzite, while the remainder of the sample are fashioned from sandstone. A source for the orthoquartzite is uncertain, but Cretaceous age sedimentary quartzite is found in McPherson County (Tolsted and Swineford 1984:58). Sandstone, which comprises the raw material for the other specimens, is obtainable from surface exposures and outcrops in the nearby Chautauqua Hills and can be found in other locations to the north within the range of Great Bend influence. The exact source of the sandstone in the collection is not known. The limestone is certainly of local origin.

The two orthoquartzite handstones have been shaped by pecking. The one from 14CO385 is apparently a portion of a small, circular or oval grinding stone; the other from 14CO1 is circular. Edges on both are rounded. The artifact from 14CO385 has a plano-convex cross section. Both flat surfaces have been ground; in fact, grinding has proceeded to the point where shallow depressions are evident. Striations produced by the grinding are not apparent. The specimen from 14CO1 is perhaps more complete and biscuit-shaped. One face has been worn by some grinding activity, which, like the one from 14CO385, has left two distinct shallow depressions on the worked face. The other side shows only scant wear.

The sandstone tool fragments are not, for the most part, as distinctive in shape nor are their functions as obvious. Most exhibit at least some wear. A few fragments appear to have been part of larger, shaped artifacts. The most interesting sandstone tool is a small, irregularly shaped abrader (Figure 14c). Abraders served functions in the manufacture of arrowshafts, flintknapping, and making pointed tools of wood, bone, and antler (Flenniken and Ozbun 1988). Each use-type imparts distinctive forms of abrasion, which, based on experimental, ethnographic, and archeological analogies,

suggest specific functions. Shaft abraders have typically U-shaped, narrow, linear grooves, while abraders used in flintknapping to grind and smooth edges or prepare flake platforms exhibit "straight grooves with V-shaped cross-sections and [are] of uneven depths" (Flenniken and Ozbun 1988:46). The final type of abrader, that used to make pointed piercing tools or pressure flakers, characteristically displays grooves that are "not straight and [that] are deeper in the center than at both ends. The grooves extend only part way across the stone and may end abruptly. In cross-section, the grooves are semicircular or U-shaped" (Flenniken and Ozbun 1988:50). The artifact, which is from the Radio Lane site, has wear marks that are convergent, deeper at their midpoint than at the ends, and generally U-shaped in cross section. When compared with Flenniken and Ozbun's descriptions, it is evident that the abrader conforms most closely to the type used to make pointed wood, bone, or antler tools.

The sole limestone object from Feature 2, an apparent trash-filled pit, at 14CO385 shows wear on one face. Determination of the kind and amount of the wear is difficult, however. The stone is soft and friable and it appears that much of the original used surface has weathered away. The slab is irregular in shape and made of fine limestone.

CERAMICS

Based on his 1940 investigations of Great Bend aspect sites, Wedel (1949) defined two basic pottery wares, one of which included several types. Smith (1949) added another type following work at the Major site (14RC2). For the central Kansas sites, in particular those in Rice County, Wedel named the Geneseo Ware, which was divided into Geneseo Plain, Geneseo Red Filmed, and Geneseo Simple Stamped (Wedel 1949:88-90). Undefined was a minority type of cord-roughened pottery, and it was this type that Smith (1949:295) termed Little River Cord Roughened. Loosle (1991) has argued that this type predates the other wares. The sites in Cowley County, namely Larcom-Haggard, Elliott, and Country Club, displayed much less variety, based on the available sample. In fact, all of the pottery was classified as Cowley Plain (Wedel 1949:87). Some Cowley Plain pottery is found in central Kansas Great Bend sites, just as Geneseo types show up in the Arkansas City sites (Wedel 1959:359-362).

The sites reported here yielded both Cowley and Geneseo types; none of the Little River Cord Roughened was found. Cowley Plain is shell-tempered and gray, buff, or brown in color. The type consists of flat to rounded bottom, amphora-like jars and apparently deep, round bottom, round shouldered bowls. Vessels may possess two handles, either loop or strap, set on opposite sides of the vessel just above the shoulder and below the lip. Handles are often riveted onto the vessel. Exteriors are smoothed, but interiors tend to be rather uneven in their finish. Rims are usually unthickened and either straight or outflaring; lips are flattened or rounded and often contain diagonal impressions as decorations (Wedel 1949:87). Thies (1991a) recovered a Cowley Plain vessel that has been recently reconstructed (Figure 12).

Geneseo types are generally similar in body form, though Geneseo Red Filmed vessels tend to be more globular or pear-shaped with constricted mouths and short tapered necks. All of the Geneseo types differ from Cowley Plain in that they are sand- or grit-tempered. Geneseo Plain has plain, dark to light gray exteriors. Interiors are unevenly finished. Bases are flat to rounded, and rims are unthickened, straight to recurving, with rounded or occasionally flattened lips. Lips may be decorated with diagonal incisions, punctations, or scallops. Handles are not common but, if present, include a variety of forms from two opposed loop or strap handles, to tabs, to a narrow decorated neck fillet set just below the lip, to a single or double row of protuberances. Geneseo Red Filmed, with smoothed exteriors and irregular interiors, has a dull to bright red wash or slip. Probably because it was unevenly applied, the slip has burned off during firing, and the resulting finish appears somewhat patchy (Wedel 1949:89). Wedel (1949:89) had no data on base form, but rims tend to be unthickened, lips rounded, and

appendages rare. Geneseo Simple Stamped has smooth exteriors, decorated with all-over, though sometimes nearly obliterated, stamping applied with a grooved or thong-wrapped paddle. As with the other types, interiors are coarsely finished. Bases are characteristically rounded; rims are unthickened and either straight or recurved and outflaring; lips are most often rounded, though infrequent flattening with decorations does occur (Wedel 1949:90).

The sample of pottery from the 1992-1993 KSHS investigations is small, consisting of only 25 sherds from the Larcom-Haggard site and 27 from the Radio Lane site. The 25 sherds from 14CO1 include 11 (44.0 percent) Cowley Plain vessel fragments and 14 (56.0 percent) Geneseo sherds. The Geneseo types include Geneseo Red Filmed (n=1, 4.0 percent) and Geneseo Plain (n=13, 52.0 percent) sherds. All of the sherds are from plow zone contexts; a few reflect this in damage to either interior or exterior surfaces. Thicknesses of the sherds range from 3.57 to 8.41 mm on undamaged sherds (n=21, 84.0 percent).

The ceramics from 14CO385 divide about evenly into Cowley Plain (n=14, 51.9 percent) and two Geneseo types (n=13, 48.1 percent). The Geneseo types are Geneseo Red Filmed (n=1, 3.7 percent) and Geneseo Plain (n=12, 44.4 percent). There are only two rim sherds, one from a Geneseo Plain vessel and the other from a Cowley Plain pot. The rims are both unthickened and appear to be everted; lips are rounded and bear no decoration. Both rim sherds are small, however, and decorative affects may not be apparent. Nineteen of the 27 sherds (70.4 percent) are from the plow zone of the site. The remaining eight, including the Red Filmed body sherd, are from Feature 2 (n=4), Feature 6 (n=3), and unit 2, 40-50 cm (sub-plow zone) (n=1). Thicknesses range from 3.53 to 12.97 mm on undamaged sherds (n=26).

FAUNA

The faunal remains from the project area are from two sites, 14CO385 and 14CO1. Since features were not encountered at 14CO1 during the testing but were at 14CO385, most of the material is from the Radio Lane site.

Larcom-Haggard Site (14CO1)

A small assemblage of faunal material was collected at 14CO1. A single left M/2 (second molar) from a bison was recovered from the surface of the site. The style exhibits moderate wear, suggesting a fully mature animal more than five years old (Reher 1974:116). Wear on the crown is not extensive, suggesting that the individual was relatively young.

Twenty unidentifiable fragments of bone were recovered from four test excavation units at this site. This assemblage represents a light scatter of highly fragmented material. Evidence of intense burning and extensive fragmentation raises the possibility that bone itself may have been used as a source of food energy by crushing it into small pieces for preparation of bone grease or soup.

Radio Lane Site (14CO385)

The faunal assemblage from 14CO385 contains 1,530 specimens, of which 257 (16.8 percent) were classified as identifiable and 1,273 (83.2 percent) were considered as unidentifiable. Two bone tools were also identified in the collection.

The greatest concentrations of identifiable faunal material were associated with two excavated features, Feature 3 (n=46) and Feature 6 (n=201). Three additional identifiable elements were collected from Scraped Area 1, and six were recovered from the general matrix of the excavation units. Feature 3 contained bison (n=43), deer (n=2), and miscellaneous large mammal (n=1). Nine of the specimens are burned. Evidence of butchering in the form of cut marks, impact fractures, and green bone fractures is present on 52.2 percent of the elements. These features indicate that both meat and bone were being processed.

The assemblage contains a high frequency of limb elements, suggesting that selective

butchering was taking place at this site. Legs apparently were removed from the carcasses and carried to a specified activity area for specialized processing, which included fracturing large long bones so that marrow could be removed. The presence of some elements from the torso and skull indicates that other portions of carcasses were also present at the site. It is suggested here that Feature 3 is associated with an activity area where specialized processing of selected bone elements took place. Feature 6 may have served the same function in part. Fractured long bones and other elements may have been further processed by breaking them into small pieces and boiling them to extract fat. This would have created broth for soup and grease. Bone grease packed in animal bladders can be stored for up to three years without spoiling and was used in cooking and as flavoring (Vehik 1977:171). Bone grease was also used in combination with dried and pulverized berries and meat to make pemmican, an easily stored, highly nutritious, high energy food (Densmore 1929:44; Lowie 1924:349, cited in Vehik 1977:171). A similar pattern is also suggested for deer bone. Other elements may have been processed elsewhere. Three complete right lateral malleoli indicate that the partial remains of at least three bison are represented. Two deer elements indicate a minimum of one for this genus.

The largest sample of fauna (n=201) was recovered from Feature 6. The large majority of these (n=183, 91.0 percent) are elements from the carapaces of turtles, probably terrapene (box turtles). No evidence of butchering was observed on these specimens, and only 15 are partially burned. Based on the identification of two nucal bones, these remains represent at least two complete or nearly complete carapaces. Only one non-carapace element, a long bone fragment, was identified. No skull or plastron elements are present. This may be an indication that carapaces were reserved for other functions after the animal was butchered and the meat consumed. There is considerable ethnographic evidence from the Plains for the use of turtle shells as containers and rattles. The remaining 18 elements represent bison (n=10), deer (n=4), beaver (n=1), fish (n=1), and miscellaneous large mammal (n=2). A minimum number of one individual is represented by each of these taxa.

Five bison elements and one rabbit element were identified in non-feature portions of the excavation units. All but one bison tooth were from unit 3. The material consists of teeth, carpals, and tarsals, most in fragmented condition. All of the elements are small and inconspicuous and were probably part of the general scatter of material on the site surface. Three bison elements, two molar fragments and one second phalanx, were collected from Scraped Area 1. These elements are all severely weathered, probably a result of exposure on the site surface during and after occupation. Only the bison phalanx exhibits green bone fractures.

A total of 1,273 unidentifiable bone fragments are included in this assemblage. This material was collected throughout the site. As with the identifiable fauna the largest quantities were recovered from Feature 3 (53.0 percent), Feature 6 (29.8 percent), and Feature 2 (5.2 percent). Approximately one quarter (24.8 percent) of the unidentifiable bone exhibits evidence of cultural modification. The largest portion was burned or calcined material, found primarily in association with Features 3 and 6. Green bone fractures and butchering marks were relatively infrequent (4.03 percent). This may be a reflection of the small size and weathered condition of the elements.

A utilized scapula tool and an incomplete deer metapodial tool (Figure 14d) were recovered from Feature 6. These indicate a bone tool industry at the site. The scapula tool, which is interpreted as a fragment of a "squash knife" or hoe, also suggests plant processing and possibly agriculture at the site.

The unidentified material from the general excavation units and scraped areas consists of small fragments of weathered bone. The low frequency of bone in general and the lack of distinctive concentrations suggests that this material was part of a very low density scatter of small fragments. This material would have been

exposed on the surface and subject to weathering and trampling.

The faunal assemblage, derived mostly from the test units at the site, provides important clues to a number of the economic activities that were carried out at the site. Clearly hunting was an important subsistence activity. The primary emphasis was on large ungulates, such as bison and deer, but smaller animals were also utilized. Small animals, such as rabbit and beaver, may have been hunted individually, or they may have been trapped. Turtles could have been captured in the area with little effort. Fishing or fish trapping also may have been a subsistence activity.

The presence of elements from bison torsos and skulls at other locations within the site area suggests that a heavy butchering technique was employed in processing these animals. This type of butchering usually indicates that the animals were killed near the site and that entire carcasses were transported to the site for processing. Heavy butchering also implies that animals were killed individually or in relatively small numbers, allowing sufficient time to thoroughly process meat and bone (Haury 1981:409-412; Kehoe 1967:69; Marshall 1976:361; White 1952:338).

SUMMARY AND CONCLUSIONS

During the fall of 1992 and summer of 1993, the Kansas State Historical Society investigated several sites in a section of the lower Walnut River valley adjacent to Arkansas City. The sites lie in the way of a proposed highway bypass, which will seriously damage portions of them. At the same time archeologists from Wichita State University examined additional sites in the valley. Four of the sites investigated--14CO1, 14CO385, 14CO501, and 14CO1509, plus another site, 14CO332--are of particular interest. These five sites, as well as numerous other sites in the valley (i.e., 14CO2, 14CO3, 14CO102, 14CO330, 14CO331, 14CO333, 14CO382, 14CO386, 14CO544, 14CO391, and the prehistoric components of 14CO387 and 14CO1510) are all attributable to the Lower Walnut focus of the Great Bend aspect. The Lower Walnut focus, named by Waldo R. Wedel following pioneering research in the valley in 1940, is believed to be related to the Wichita Indians. A large settlement named Etzanoa, perhaps lay on the banks and towering bluffs of the Walnut River and is increasingly believed by scholars to be the terminus of Juan de Oñate's trek into the plains in 1601.

Three of the sites in the bypass right-of-way, 14CO332, 14CO385, and 14CO501, have been shown to contain intact, subsurface cultural deposits. At 14CO385 sub-plow zone material was detected, and a large post mold was encountered in one test unit. Three other cultural features were identified but not excavated. Another small, slightly bell-shaped pit was salvaged after it was damaged during geomorphic deep trenching. The major indicator of subsurface material at 14CO332, a site investigated in 1990, is a large, trash filled cache pit. Artifacts from the pit included a variety of domestic trash, a reconstructible Cowley Plain pot, and charcoal. The pit was encountered and excavated in a Conoco pipeline trench. WSU archeologists uncovered four pits at 14CO501. Artifacts from the caches were a Cowley Plain vessel, five bison scapulas prepared as hoes, and a stone maul. Subsurface features and intact material were not found at either 14CO1 or 14CO1509.

The sites in the project area have provided some interesting data on the sources and processing of stone for tools. In particular, Florence A chert was the preferred chert of the Lower Walnut focus peoples. Although other types of stone appear, they are always in the minority. Factors that led the Lower Walnut people to rely so heavily upon Florence A include its proximity, its generally good quality, and its further improvement by heat treatment. In its thermally altered state, Florence A is the highest quality material available in the region. Gray Permian cherts may have been used mainly out of expediency, rather than for any functional or aesthetic reason. Mississippian and other "exotic" stone may also represent "on-the-road"

expediency or instances of stone being traded into the area.

Direct acquisition of Florence A was undoubtedly the chief mode of its entry into the Lower Walnut sites. The material is too abundant in the sites for this not to be the case. What is not clear is whether forays were made to the quarries explicitly for stone procurement or whether acquisition was "embedded" in some other task, such as hunting (e.g., Binford 1979). Given the intensity of the quarrying inferred from the quarry holes and volume of debris at the Maple City/Kay County quarries, it is probably unnecessary to invoke embeddedness. The source of the chert is only 15 to 20 miles distant from the lower Walnut River valley, so trips to the locale would not have been very involved. By the time of the greatest development of the Lower Walnut sites, it is probable that the Lower Walnut people effectively controlled access to the quarries (Vehik 1990).

The data from the Arkansas City sites is somewhat limited at this stage but does allow us to see that the Lower Walnut Great Bend peoples utilized their environments in specific ways, ways that certainly differ from those of earlier populations. From the data at hand, the procurement of knappable stone was one of selective and large-scale quarrying of the Florence A. The debitage analysis, though limited in scope, indicates that initial shaping of large blanks was performed either at the quarries or at locations other than the big village sites in the Arkansas City area. Moreover, one of the most important manufacturing strategies was the production of large and small bifaces. Some of these are certainly identifiable tool forms (e.g., alternately beveled knives, triangular arrowpoints, several drill varieties), but other biface production can be viewed as intermediate stages in tool production. It would appear that very large Florence A bifaces usually, if not always heated, were a primary source of flakes for the production of small triangular arrowpoints and other small tools. Biface thinning flakes, removed from large bifaces, are often of uniform thickness (or thinness), making them ideal sources for such later production stages. The lack of cortical and unheated Florence A debitage at the Radio Lane site and other sites in the valley would suggest that the actual production of large bifaces was occurring elsewhere and that semi-finished forms (essentially bifacial cores) were the earliest knapping stage present in the sites. This suggests a heightened degree of manufacturing complexity, complexity perhaps equatable with some degree of standardization, for the Great Bend aspect peoples than has been observed for some other prehistoric and early historic peoples within the same geographic region.

The volume of ground stone artifacts from the sites is small. Sandstone, orthoquartzite, and limestone tools are present. The varieties of stone employed as grinding implements is perhaps functionally related to specific tasks, but the sample of material is still too small and from generally suspect contexts (e.g., the plow zone) to say what those functions may have been. Certainly, however, the processing of plant materials, much of it perhaps derived from horticulture, had to rate chief among the uses of such tools.

The ceramic assemblage, too, is rather small. It is interesting that Wedel's sample of pottery consisted almost entirely of Cowley Plain with various Geneseo types in a definite minority (Wedel 1959:359). The ceramics from the Radio Lane and Larcom-Haggard sites divides about evenly between Cowley Plain and Geneseo wares. Two Geneseo types, Red Filmed and Plain, are present, with Geneseo Plain being the more common of the two. The contexts from which the overall sample was derived are varied (e.g., plow zone, subsurface, pits), with most material being from the plow zone. Several possibilities arise to account for the presence of the Geneseo types: trade with the Little River sites, a late movement of Little River peoples into the lower Walnut River valley, and two coexisting ceramic traditions. The latter seems unlikely, as Geneseo types are not as common as Cowley Plain ceramics. A late movement (post-A.D. 1650) has been suggested by Wedel (1959:586), and so the Geneseo pottery present

at the sites could be the product of Little River focus peoples sharing the valley with their Lower Walnut kin. The possibility that the ceramics could be accounted for by trade with the central Kansas sites cannot be discounted, however. Trade between the two complexes is known to have occurred. The presence of Florence A in the central Kansas Great Bend sites in Rice, McPherson, and Marion counties is the major piece of evidence.

The faunal assemblage from 14CO385 contains representative species from three of the major classes of the animal kingdom: reptiles, fish, and mammals. Mammals, primarily bison and deer, represent by far the most significant animal resources utilized by the site occupants. There is evidence that meat, marrow, and the bone itself were used. Evidence of butchering was common on these elements, and the major long bones appear to have been opened to remove marrow, an important source of many nutrients and calories for energy and warmth. Bone tools were also manufactured from large mammal bones.

Elements from two other mammals, rabbit and beaver, were also identified. Although neither of these elements exhibited direct evidence of human modification the beaver tooth was found within a cultural feature. Both of these genera were common during the prehistoric and early historic periods and would have provided ready sources of meat and furs, and in the case of beaver, valuable fat stores as well. Reptiles are represented by bone from at least two turtles. These animals would have been common in the environment and could have been easily caught. Collection of turtles could have been an embedded activity, i.e., an activity conducted is association with other activities, such as plant gathering. Turtle meat is a good source of fat energy, and the shells probably were utilized for a variety of functions. Fish are represented by a single charred vertebra from Feature 6. Although this is scant evidence, it is quite probable that fish from the Walnut and Arkansas rivers were utilized as a food resource.

Archeological investigations in the valley are far from complete and will ultimately include full-scale excavations in conjunction with both the Arkansas City Bypass and levee and the U.S Highway 166 upgrade (Hawley et al. 1993). The bypass will effectively sample several sites in a north-south trending fashion, while the U.S. 166 upgrade will cross the valley west to east and ascend the bluffs. The investigations will provide the opportunity to refine the chronology of the Lower Walnut occupation of the valley and indicate possible antecedents, as well as further understanding of the actual settlement of the valley, the subsistence base, stone and ceramic technologies, and trade.

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REFERENCES CITED

Banks, L. D.
1984 Lithic Resources and Quarries. In *Prehistory of Oklahoma*, edited by R. E. Bell, pp. 65-95. Academic Press, New York.

1990 *From Mountain Peaks to Alligator Stomachs*. Memoir No. 4. Oklahoma Anthropological Society, Norman.

Beckman, P.
1943 *The Catholic Church on the Kansas Frontier 1850-1877*. The Catholic University of America, Washington, D.C.

Berger, R. N., and B. R. Oldroyd
1969 *Between the Rivers, Pioneer Tales of Arkansas City, Kansas*, Vol. 1. Mennonite Press, North Newton, Kansas.

Binford, L. R.
1979 Organization and Formation Processes: Looking at Curated Technologies. *Journal of Anthropological Research* 35(3):255-273.

Blackmar, F. M.
1912 *Kansas*. Standard Publishing Company, Chicago.

Blaine, M. R.
1982 The Pawnee-Wichita Visitation Cycle: Historic Manifestations of an Ancient Friendship. In *Pathways to Plains Prehistory: Anthropological Perspectives of Plains Natives and their Pasts*, edited by D. G. Wyckoff and J. L. Hofman, pp. 113-134. Memoir No. 3 of the Oklahoma Anthropological Society, and Contributions No. 1 of the Cross Timbers Heritage Association, Duncan, Oklahoma.

Brown, K. L.
1987 Arkansas River Lowlands. In *Kansas Prehistoric Archaeological Preservation Plan*, edited by K. L. Brown and A. H. Simmons, pp. 16.1-16.16. Office of Archaeological Research, Museum of Anthropology, and Center for Public Affairs, University of Kansas, Lawrence.

Connelley, W. E.
1928 *History of Kansas, State and People*. 5 vols. American Historical Society, Inc., Chicago.

Cooper, L. M.
1975 A Study of Kay County Flint. *Bulletin of the Oklahoma Anthropological Society* 23:185-192.

Densmore, F.
1929 *Chippewa Customs*. Bulletin No. 86. Bureau of American Ethnology, Smithsonian Institution, Washington, D.C.

Elam, E. H.
1971 The Origin and Identity of the Wichita. *Kansas Quarterly* 3(4):13-20.

Ferguson, R. B.
1992 Tribal Warfare. *Scientific American* 226(1):108-113.

Flenniken, J. J., and T. L. Ozbun
1988 Experimental Analysis of Plains Grooved Abraders. *Plains Anthropologist* 33(119):37-52.

Gould, C. N.
1898a Prehistoric Mounds in Cowley County. *Transactions of the Kansas Academy of Science* 15:79-80.

1898b The Timbered Mounds of the Kaw Reservation. *Transactions of the Kansas Academy of Science* 15:78-79.

1899 Additional Notes on the Timbered Mounds of the Kaw Reservation. *Transactions of the Kansas Academy of Science* 16:288.

1921 Where Did the Indians of the Great Plains Get their Flint? *Proceedings of the Oklahoma Academy of Science* 1:71-76.

Gould, R. R.
1975 *An Archeological Survey of the Bluff Creek Drainage System.* Unpublished Master's thesis, Department of Anthropology, Wichita State University, Wichita, Kansas.

Gunnerson, J. H.
1987 *Archaeology of the High Plains.* Cultural Resource Series No. 19. Bureau of Land Management, Denver.

Hammond, G. P., and A. Rey
1953 *Don Juan de Oñate, Colonizer of New Mexico 1595-1628.* University of New Mexico Press, Albuquerque.

Haury, C. E.
1979 Characterization of the Chert Resources of the El Dorado Project Area. In *Finding, Managing, and Studying Prehistoric Cultural Resources at El Dorado Lake, Kansas (Phase 1)*, edited by G. R. Leaf, pp. 209-227. Research Series No. 2. Museum of Anthropology, University of Kansas, Lawrence.

1981a Chert Types and Terminology for the Upper Walnut River Drainage. In *Prehistory and History of the El Dorado Lake Area, Kansas*, edited by M. J. Adair, pp. 45-53. Project Report Series No. 47. Museum of Anthropology, University of Kansas, Lawrence.

1981b Mammalian Fauna 14BU9. In *Prehistory and History of the El Dorado Lake Area, Kansas*, edited by M. J. Adair, pp. 405-434. Project Report Series No. 47. Museum of Anthropology, University of Kansas, Lawrence.

Hawley, M. F.
1992 Albert C. Spaulding, KU Years: 1946-1947. *The Kansas Anthropologist* 13(1 and 2): 23-37.

Hawley, M. F., R. D. Mandel, C. M. Schoen, S. L. White, B. G. Williams, and V. A. Wulfkuhle
1993 *Cultural Resource Investigations for the U.S. Highway 166 Corridor.* Contract Archeology Publication No. 11. Archeology Office, Kansas State Historical Society, Topeka.

Hawley, M. F., R. D. Mandel, C. E. Haury, M. King, J. D. Reynolds, and T. Weston
1994 Archeological and Geomorphological Investigations of Sites in the Vicinity of Arkansas City, Cowley County, Kansas. Contract Archeology Publication. Archeology Office, Kansas State Historical Society, Topeka, in press.

Hofman, J. L.
1984 The Western Protohistoric: A Summary of the Edwards and Wheeler Complexes. In *Prehistory of Oklahoma*, edited by R. E. Bell, pp. 109-117. Academic Press, New York.

Holmes, W. H.
1894 *An Ancient Quarry in Indian Territory.* Bureau of American Ethnology, Smithsonian Institution, Washington, D.C.

1919 *Handbook of Aboriginal American Technology, Part 1, The Lithic Industries.* Bulletin 60. Bureau of American Ethnology, Smithsonian Institution, Washington, D.C.

Hunt, E.
1930 Letter to William E. Connelley, February 21, 1930. Correspondence on Archeology. Archives, Kansas State Historical Society, Topeka.

Johnson, C. P.
1897 Mound in Cowley County, Kansas. *The Antiquarian* 1:95-96.

Kehoe, T. F.
1967 The Boarding School Bison Drive. *Plains Anthropologist* Memoir No. 4, 12(35).

Kuchler, A. W.
1974 New Vegetation Map of Kansas. *Ecology* 55(3):586-604.

Lees, W. B.
1987 Highway Archeology Salvage Program Investigates Great Bend Aspect Site. *Kansas Preservation* 9(3):6-8.

Lees, W. B., J. D. Reynolds, T. J. Martin, M. J. Adair, and S. Bozarth
1989 Final Summary Report: 1986 Archeological Investigations at 14MN328, A Great Bend Aspect Site along U.S. Highway 56, Marion County, Kansas. Submitted to Kansas Department of Transportation. Ms. on file, Archeology Office, Kansas State Historical Society, Topeka.

Lintz, C.
1984 The Plains Villagers: Antelope Creek. In *Prehistory of Oklahoma*, edited by R. E. Bell, pp. 325-346. Academic Press, New York.

Loosle, B. N.
1991 Social Interactions Among the Late Plains Village Populations in the Central Plains. Unpublished Ph.D. dissertation, Department of Anthropology, University of Kansas, Lawrence.

Lowie, R. H.
1924 Minor Ceremonies of the Crow Indians. *Anthropological Papers of the American Museum of Natural History* 24. New York.

Mandel, R. D.
1987 The Environment of Kansas. In *Kansas Prehistoric Archaeological Preservation Plan*, edited by K. L. Brown and A. H. Simmons, pp. 3.1-3.30. Office of Archaeological Research, Museum of Anthropology, and Center for Public Affairs, University of Kansas, Lawrence.

Marshall, L.
1976 Sharing, Talking, and Giving: Relief of Social Tensions Among the K!ung. In *Kalahari Hunter-Gatherers*, edited by R. B. Lee and I. DeVore, pp. 349-371. Harvard University Press, Cambridge.

Millington, D. A., and E. P. Greer
1900 History of Cowley County, Kansas. Supplement to the *Winfield Courier*, Winfield, Kansas.

Monger, E.
1970 A Preliminary Report of the Larned Site. *Kansas Anthropological Association Newsletter* 15(8):1-13.

Mooney, J.
1907 Wichita. In *Handbook of Indians North of Mexico*, edited by F. W. Hodge, pp. 947-950. Bulletin No. 30. Bureau of American Ethnology, Smithsonian Institution, Washington, D.C.

Morris, W.
1970 The Wichita Exchange: Trade on Oklahoma's Fur Frontier, 1719-1812. *Great Plains Journal* 9(2):79-84.

Newcomb, W. W., and T. N. Campbell
1982 Southern Plains Ethnohistory: A Re-examination of the Escanjaques, Ahijados, and Cuitos. In *Pathways to Plains Prehistory: Anthropological Perspectives of Plains Natives and their Pasts*, edited by D. G. Wyckoff and J. L. Hofman, pp. 29-43. Memoir No. 3 of Oklahoma Anthropological Society and Contributions No. 1 of the Cross Timbers Heritage Association, Duncan, Oklahoma.

Newcomb, W. W., and W. T. Field
1967 An Ethnohistoric Investigation of the Wichita Indians in the Southern Plains, Part I, A Calendrical Summary of Wichita Ethnohistory. In *A Pilot Study of Wichita Indian Archeology and*

Ethnohistory, edited by R. E. Bell, E. B. Jelks, and W. W. Newcomb, pp. 243-309. Submitted to the National Science Foundation, Washington, D.C.

Newman, T. K.
1957 *The Blackdog Trail.* Christopher Publishing House, Boston.

O'Brien, P. J.
1984 *Archeology in Kansas.* Public Education Series No. 9. Museum of Natural History, University of Kansas, Lawrence.

O'Bryant, A.
1947 Differences in Wichita Indian Camp Sites as Revealed by Stone Artifacts. *Kansas Historical Quarterly* 15(2):143-150.

Purdy, B. A.
1975 Fractures for the Archaeologist. In *Lithic Technology*, edited by E. Swanson, pp. 133-141. Mouton Publishers, The Hague, Belgium.

Ray, J.
1982 The Effects of Heat Treatment on Cherts from the Truman Reservoir. *The Missouri Archaeologist* 43:67-85.

Reher, C. A.
1974 Population Study of the Caspar Site Bison. In *The Caspar Site*, edited by G. C. Frison, pp. 113-124. Academic Press, New York.

Remsburg, G. J.
1917 Miscellaneous Notes. *The Archaeological Bulletin* 8(1):8.

Rohn, A. H., B. M. Larson, and A. M. Emerson
1982 *A Survey and Assessment of the Cultural Resources at Kaw Lake, Northern Section (Kansas).* Submitted to U.S. Army Corps of Engineers, Tulsa District.

Salm, E. E.
1971 Site Survey Forms for 14CO801, 14CO802, and 14CO806. Forms on file, Archeology Office, Kansas State Historical Society, Topeka.

Schoewe, W. E.
1949 The Geography of Kansas, Part II, Physical Geography. *Transactions of the Kansas Academy of Science* 52(3):261-333.

Scholes, F. V., and H. P. Mera
1940 Some Aspects of the Jumano Problem. Contributions to American Anthropology and History Publication No. 523. Carnegie Institution, Washington, D.C.

Smith, C. S.
1949 Archaeological Investigations in Ellsworth and Rice Counties, Kansas. *American Antiquity* 15(4), Part 1:292-300.

Spring, O. F.
1967 Prehistoric Chert Quarries in Kay County: A Report. *The Chronicles of Oklahoma* 45(1):5-11.

Thies, R. M.
1991a Archeological Resources of Selected Portions of the Lower Walnut Valley: Results of the 1990 Investigation. Submitted to U.S. Army Corps of Engineers, Tulsa District. Ms. on file, Archeology Office, Kansas State Historical Society, Topeka.

1991b Results of an Archeological Survey of Certain Portions of the Northern Section of the Proposed Arkansas City Bypass Area: The 1990 Investigation. Submitted to Kansas Department of Transportation. Ms. on file, Archeology Office, Kansas State Historical Society, Topeka.

1991c New Data on Lower Walnut Focus. Paper presented at the 49th Plains Anthropological Conference, Lawrence, Kansas.

Thoms, A. V.
1979 Cultural Resource Reconnaissance and Preliminary Assessment for the Arkansas City Local Flood Protection Project, Cowley County, Kansas. Submitted to U.S. Army Corps of Engineers, Tulsa District.

Tolsted, L., and A. Swineford
1984 Rocks. In *Kansas Geology: An Introduction to Landscapes, Rocks, Minerals, and Fossils*, edited by R. Buchanan, pp. 40-66. University Press of Kansas, Lawrence.

Topeka Daily State Journal [Topeka, Kansas]
1935 Flint Hills Find. 13 May:7.

Vehik, S. C.
1977 Bone Fragments and Bone Grease Manufacturing: A Review of their Archaeological Use and Potential. *Plains Anthropologist* 22:169-182.

1986a Oñate's Expedition to the Southern Plains: Routes, Destinations, and Implications for Late Prehistoric Cultural Adaptations. *Plains Anthropologist* 31(111):13-33.

1986b The Effects of Trade on Resource Procurement Behavior: A Late Prehistoric Example from the Southern Plains. In *Current Trends in Southern Plains Archaeology*, edited by T. G. Baugh, pp. 141-154. *Plains Anthropologist* Memoir 21, 31(114), Part 2.

1990 Late Prehistoric Plains Trade and Economic Specialization. *Plains Anthropologist* 35(128):125-145.

1992 Wichita Culture History. *Plains Anthropologist* 37(141):311-332.

Wallis, C. S., Jr.
1980 *Cultural Resource Survey, Lost-Duck Creeks Watershed, Kay County, Oklahoma*. General Survey Report No. 30. Oklahoma Conservation Commission, Oklahoma City.

Wedel, M. M.
1981 *The Deer Creek Site, Oklahoma: A Wichita Village Sometimes Called Ferdinandina, an Ethnohistorian's View*. Series in Anthropology No. 5. Oklahoma Historical Society, Oklahoma City.

1982 The Wichita Indians in the Arkansas River Basin. In *Plains Indian Studies: A Collection of Papers in Honor of John C. Ewers and Waldo R. Wedel*, edited by D. H. Ubelaker and H. J. Viola, pp. 118-134. Smithsonian Contributions to Knowledge No. 30. Smithsonian Institution, Washington, D.C.

1988 *The Wichita Indians 1541-1750, Ethnohistorical Essays*. Reprints in Anthropology No. 28. J & L Reprint Company, Lincoln, Nebraska.

Wedel, W. R.
1942 Archeological Remains in Central Kansas and their Possible Bearing on the Location of Quivira. *Smithsonian Miscellaneous Collections* 101(7).

1947 Culture Chronology in the Central Great Plains. *American Antiquity* 12:148-156.

1949 Some Central Plains Sherd Types from Kansas. In *Proceedings of the Fifth Plains Conference for Archeology*, assembled by J. L. Champe, pp. 86-90. Note Book No. 1. Laboratory of Anthropology, University of Nebraska, Lincoln.

1959 *An Introduction to Kansas Archeology*. Bulletin No. 174. Bureau of American

Ethnology, Smithsonian Institution, Washington, D.C.

1967 The Council Circles of Central Kansas: Were They Solstice Registers? *American Antiquity* 32(1):54-63.

1968 After Coronado in Quivira. *The Kansas Historical Quarterly* 20(4):369-385.

1975 Chain Mail and Plains Archeology. *Plains Anthropologist* 20(69):187-196.

1978 Commentary. In *The Central Plains Tradition: Internal Development and External Relationships*, edited by D. J. Blakeslee, pp. 152-162. Report No. 11. Office of the State Archeologist, University of Iowa, Iowa City.

Weston, T., and W. B. Lees
n.d. The History and Status of an Earthworks Known as "Neodesha Fort," Kansas. Manuscript submitted to *Plains Anthropologist*.

White, T. E.
1952 Observations on the Butchering Technique of Some Aboriginal Peoples: I. *American Antiquity* 17(4):337-338.

Wilcox, S.
1975 *Winfield and the Walnut Valley*. Gilliland Publishing Co., Arkansas City, Kansas.

Witty, T. A., Jr.
1978 Along the Southern Edge: The Central Plains Tradition in Kansas. In *The Central Plains Tradition: Internal Developments and External Relationships*, edited by D. J. Blakeslee, pp. 56-66. Report No. 11. Office of the State Archeologist, University of Iowa, Iowa City.

Wright, C. M.
1985 The Complex Aspects of the "Smoky Hill Jasper," Now Known as Niobrarite. *Journal of the Kansas Anthropological Association* 5(3):87-90.

Wulfkuhle, V. A.
1993 Phase III Investigations on East Kansas Avenue in Arkansas City, Cowley County, Kansas. In *Cultural Resources Investigations for the U.S. 166 Highway Corridor*, edited by M. F. Hawley, Appendix A. Contract Archeology Publication No. 11. Archeology Office, Kansas State Historical Society, Topeka.

GEOARCHEOLOGY OF THE LOWER WALNUT RIVER VALLEY AT ARKANSAS CITY, KANSAS

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Geoarcheological investigations were conducted in the Walnut River valley near Arkansas City, Kansas, as part of the Phase II testing of Late Prehistoric sites along the proposed Arkansas City Bypass and levee. These studies focused on the geomorphology, soils, and stratigraphy at and near the archeological sites. In addition to yielding new information about Holocene landscape evolution in the lower Walnut River valley, the geoarcheological investigations provided a soil-stratigraphic framework for the cultural deposits that were found in the project area. Geologic potentials for buried archeological materials also were assessed.

INTRODUCTION

The prehistory of the lower Walnut River valley in the vicinity of Arkansas City, Kansas (Figures 1 and 2) has been studied by a number of archeologists over the past five decades (e.g., Rohn et al. 1982; Thies 1991; Thoms 1979; Wedel 1959). Although these studies yielded valuable information about the Great Bend aspect of the Late Ceramic period, the geologic context of the archeological record was rarely considered. This oversight is unfortunate because the history of late-Quaternary landscape evolution in the Walnut River valley holds important clues about prehistoric settlement patterns and site formation processes.

In August of 1990, a study of the geoarcheology of the lower Walnut River valley was initiated at Arkansas City along with the Phase II archeological testing of sites 14CO102, 14CO544, 14CO330, 14CO331, 14CO332, and 14CO333 (Mandel 1990a). This study focused on the geomorphology, soils, and stratigraphy at and near the archeological sites. Similar studies were subsequently conducted at sites 14CO501, 14CO1509, 14CO1510, 14CO382, 14CO385, and 14CO387 (Mandel 1994). This paper summarizes the results of these investigations.

The primary goal of the geoarcheological investigation was to better understand the late-Quaternary geomorphology and alluvial stratigraphy of the lower Walnut River valley, especially as this pertains to human occupation of the area during prehistoric and protohistoric times. The specific objectives were to 1) identify late-Quaternary landform-sediment assemblages, 2) describe alluvial deposits and buried soils, and 3) establish a radiocarbon chronology for the evolution of late-Quaternary landform-sediment assemblages. The collection of this information was designed to contribute to the study of known archeological sites and to help predict the distribution and character of as yet undetected cultural deposits.

ENVIRONMENTAL SETTING

The project area is immediately east of Arkansas City in Cowley County and parallels the Walnut River from about .5 km northwest of its confluence with the Arkansas River to North Creek about 6.5 km upstream (Figure 1). This area is located on the boundary between two subdivisions of the Central Lowland Physiographic Province: the Arkansas River Lowlands and the Flint Hills Upland. The eastern half of the Arkansas River Lowlands, which includes the project area, is referred to as the Great Bend Lowlands (Fenneman 1931:27-28; Schoewe 1949). This region is parallel to the great northward bend of the Arkansas River and is an undulating alluvial plain with little relief. Surface materials of the Great Bend Lowlands are mostly unconsolidated

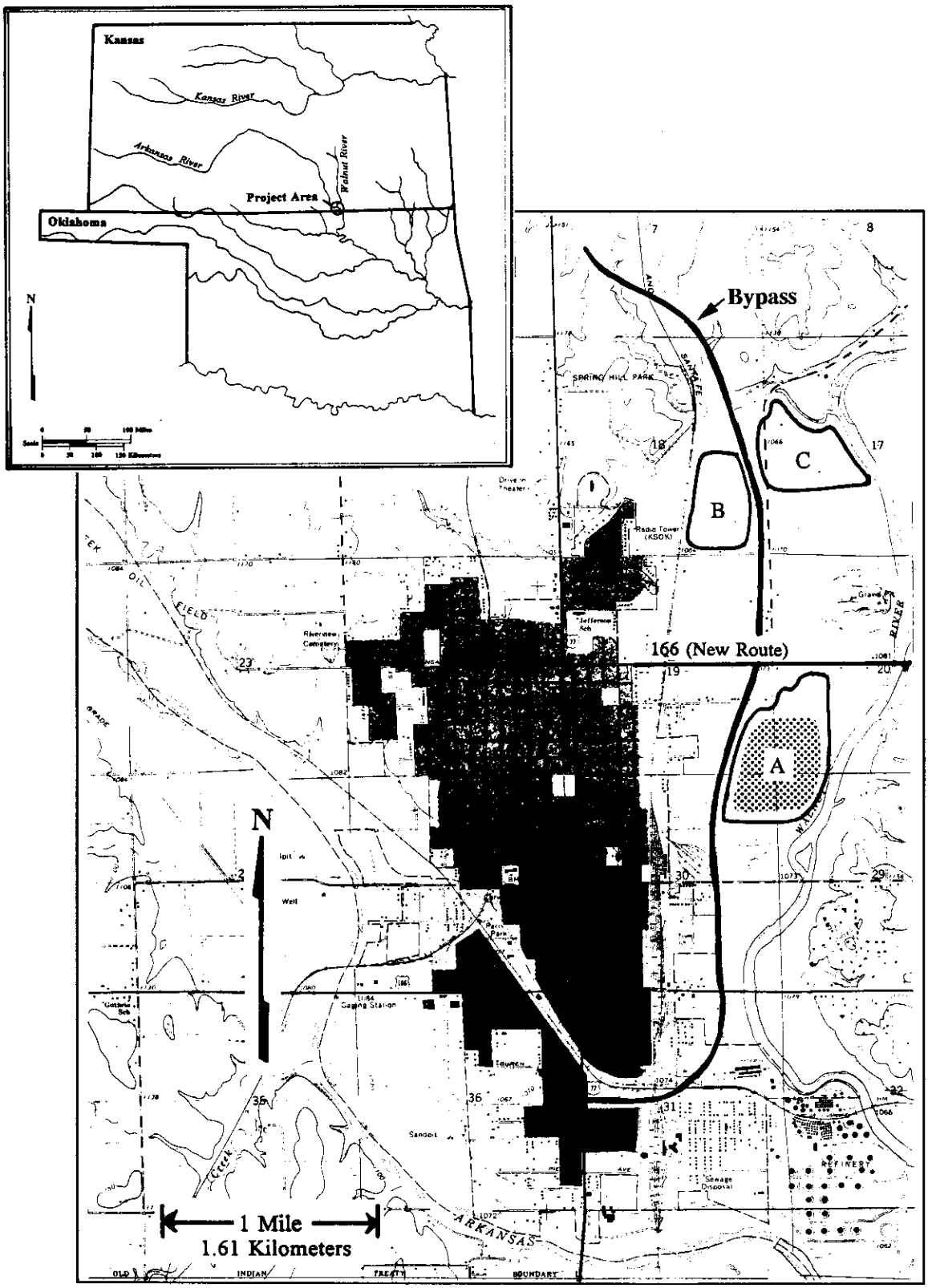

Figure 1. Map showing the location of the project area, including borrow areas (A, B, C).

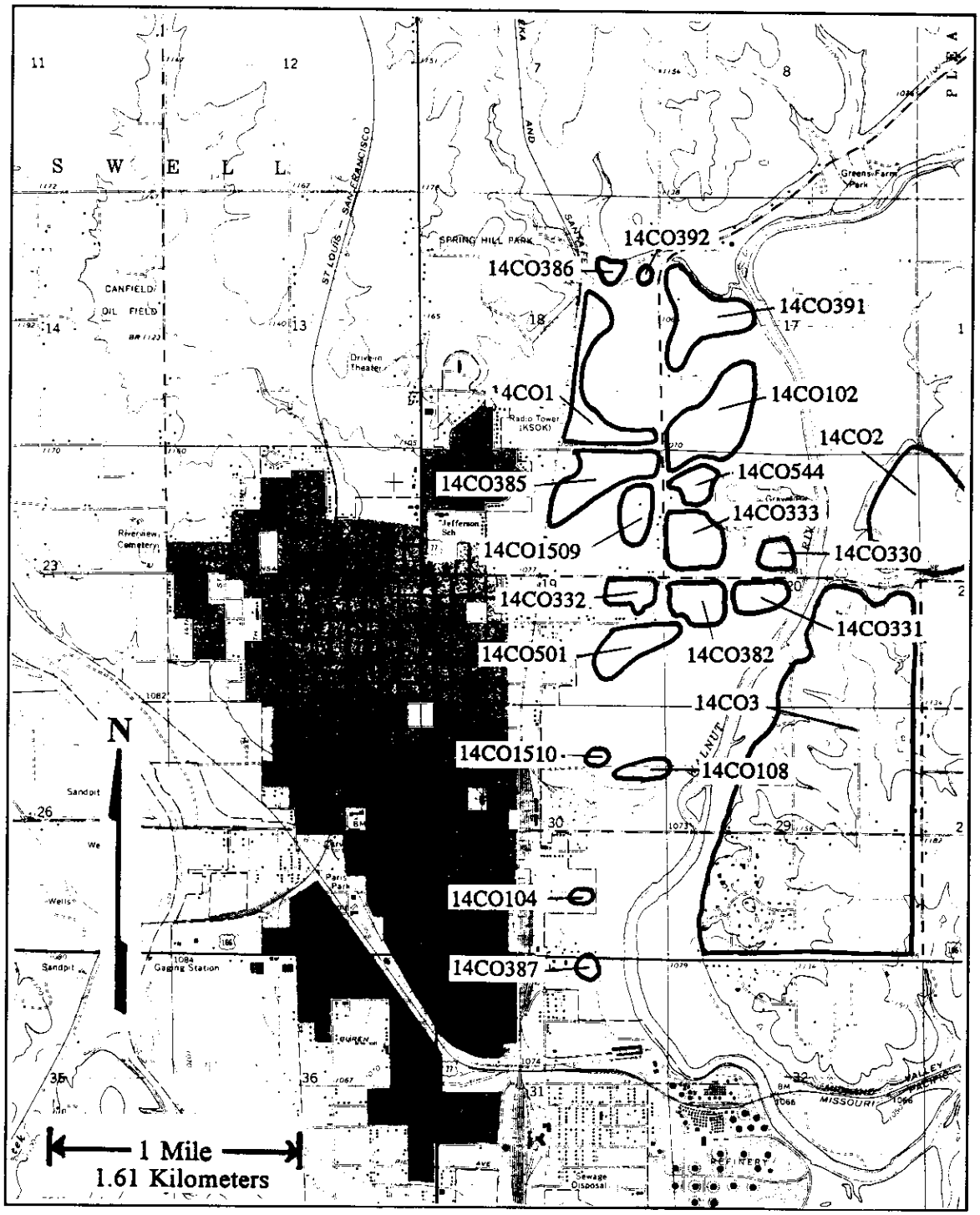

Figure 2. Map showing the location of archeological sites in the project area.

sands and gravels, deposited by the Arkansas River during the Pleistocene and Holocene. The Arkansas River meandered across this region for millions of years, leaving reworked alluvium in its abandoned channels (Mandel 1987:3.6). In many areas winds swept the sands into low, rolling dunes. Although most of the dunes are presently covered by vegetation, their hummocky shape is still apparent.

The Flint Hills Upland immediately to the north and east of Arkansas City is a division of the Osage Plains (Schoewe 1949). The Flint Hills region derives its name from the abundance of chert or flint scattered over its surface and contained within the local bedrock. Bedrock exposed in the valley walls around Arkansas City is primarily Lower Permian limestone, cherty limestone, and shale belonging to the Chase Group (see Bayne 1962:Plate 1). Differential weathering of the alternating layers of limestone and shale has shaped the Flint Hills. The beds of limestone are more resistant to weathering and form benches or escarpments, and the softer shale layers, weathering more easily, form steep eastward-facing slopes between the limestone ledges (Bayne 1962:13). Major rivers and streams have dissected portions of the Flint Hills, creating prominent rock-cut (strath) terraces above broad valley floors. The smaller streams in the region have steep gradients and deeply entrenched channels bordered by rock ledges.

The natural vegetation of the Great Bend Lowland is sand prairie (Kuchler 1974). This plant community is dominated by sandreed, switchgrass, and big and little bluestem. Forests in the Great Bend Lowland occur as narrow bands along the major streams and are dominated by cottonwood, hackberry, willow, and elm. Areas of valley floors that are poorly drained, such as abandoned channels, are excellent sites for wetland communities dominated by prairie cordgrass and other sedges.

The natural vegetation of the Flint Hills Upland is tall grass prairie (Kuchler 1974). This plant community is dominated by big and little bluestem, switchgrass, and Indian grass. The hillsides and ravines along the edges of river valleys in the Flint Hills of south-central Kansas support woodlands dominated by oak, hickory, juniper, black walnut, and various shrubs.

The climate of Kansas is continental with large daily and annual variations in temperature. Winters are short and summers are long and hot. The mean daily temperature at Winfield, Kansas, for the period 1941 to 1970 was 14.6 degrees C (58.4 degrees F) (Horsch 1980). The mean daily temperature in July and January for the same period was 27.1 degrees C (80.8 degrees F) and 1.0 degree C (33.9 degrees F), respectively (Horsch 1980). The mean annual precipitation at Winfield is about 81 cm (32 inches) (Horsch 1980). Of this, nearly 75 percent falls during the period April through September.

PREVIOUS INVESTIGATIONS

Previous studies that have provided information about late-Quaternary landscape evolution in the Walnut River basin were concentrated in the upper reaches of the drainage network. For example, Grosser (1970, 1973) and Leaf (1981) described the stratigraphy of valley fill at the Snyder site (14BU9) in the East Branch Walnut River valley near El Dorado, Kansas. This site is adjacent to and within a channel scar on a low, broad alluvial terrace (T-1). Charcoal from cultural zones 2.5 to .4 m below the terrace surface yielded radiocarbon ages ranging between ca. 4600 and 2000 B.P. The presence of Butler phase pottery in the upper 20 cm of the surface soil suggests that the terrace surface was stable by at least ca. 1800 to 1200 B.P. (Grosser 1973).

Artz (1983) conducted a detailed geomorphic study of the East Branch Walnut River. He used radiometric ages and supportive archeological evidence from 15 archeological sites to develop a late-Holocene alluvial chronology for this stream. Based largely on evidence from the Snyder site, Artz concluded that slow aggradation and concurrent (cumulic) soil formation occurred from ca. 4000 to 2000 B.P., producing an overthickened A horizon on the late-Holocene floodplain. This soil was buried in some portions of the valley after ca. 2000 B.P. but before 1800 to 1200 B.P. In other portions, however, the soil remained at the

surface and has continued to develop until the present time. Artz suggested that the East Branch Walnut River incised its valley fill at or soon after 2000 years B.P., leaving its late-Holocene floodplain as a terrace (T-1).

Several archeological studies have shed light on the alluvial history of small tributaries to the East Branch Walnut River. At the Faulconer site (14BU50) along Bird Creek, Bradley (1973) identified eight cultural zones, extending to a depth of 2 m below the surface of a low terrace. Charcoal from a zone 57 to 88 cm below the surface yielded a radiocarbon age of ca. 3100 B.P. Root (1981, 1982) conducted a detailed investigation of the Milbourn site (14BU25) in the Durechen Creek valley. He reported a radiocarbon age of ca. 4435 B.P., determined on charcoal from a feature about 2 m below the surface of the first terrace (T-1). The Two Deer site (14BU55), located on the south bank of Bemis Creek, was studied by Adair and Brown (1982). They reported a radiocarbon age of ca. 1000 B.P., determined on charcoal recovered .3 to .4 m below the surface of a levee on the lowest terrace (T-1).

Two recent studies focused on Holocene terraces and fills in the upper Walnut River basin: one in the Little Walnut River valley (Mandel 1993a) and the other in the Whitewater River watershed (Mandel 1992a). The valley floor of the Little Walnut River consists of a floodplain (T-0) and low, broad terrace (T-1). Radiocarbon assays suggest that most of the T-1 fill is late-Holocene in age (Mandel 1993a). Two terraces (T-1 and T-2) were identified on valley floors of large tributaries to the Whitewater River (Mandel 1992a). A radiocarbon age of ca. 4200 B.P. was determined on bulk organic carbon from a deeply buried soil in the T-2 fill, and ages from the T-1 fill ranged between 2700 and 2100 B.P. Only one terrace (T-1) was identified on the valley floor of small streams in the Whitewater River basin, including Wildcat Creek. Bulk organic carbon from a paleosol about 2.6 m below the T-1 surface in Wildcat Creek valley yielded a radiocarbon age of ca. 2500 B.P.

METHODS

Field and Laboratory Methods

The field investigation initially involved reconnaissance of the project area. At this early stage of the study, landforms identified on 2-foot-interval contour maps and 1:2,000-scale air-photos were field checked.

Following the field reconnaissance, a backhoe was used to excavate trenches at and near the archeological sites that were selected for Phase II testing. A total of 32 trenches were excavated in the project area (Figure 3). Each trench was about 6 to 7 m long, 2 to 3 m wide, and 2.5 to 4.0 m deep. Also, a truck-mounted Giddings hydraulic soil probe was used to take 7.6-cm-diameter cores at site 14CO387.

Detailed descriptions of soil profiles were made in the field using standard procedures and terminology outlined by Soil Survey Staff (1990) and Birkeland (1984). Reaction of soils to 10% hydrochloric acid (HCl) was noted, and stages of carbonate morphology were defined according to the classification scheme of Birkeland (1984:Table A-4). In addition, sedimentary features preserved in C horizons of soils were described to help reconstruct depositional environments.

Standard radiocarbon assays were conducted by Beta Analytic, Inc., and Geochron Laboratories. Radiocarbon ages were determined from charcoal or bulk humate samples and reported as years before present (B.P.). The samples were pretreated by the radiocarbon laboratories for removal of roots and $CaCO_3$, and all ages were $\delta^{13}C$ corrected.

Radiocarbon ages determined on humates are mean residence times for all organic carbon in the soil samples (Campbell et al. 1967). Although mean residence time does not provide the absolute age of a buried soil, it does give a minimum age for the period of soil development, and it provides a limiting age on the overlying material (Birkeland 1984:150; Geyh et al. 1975; Haas et al. 1986; Scharpenseel 1975).

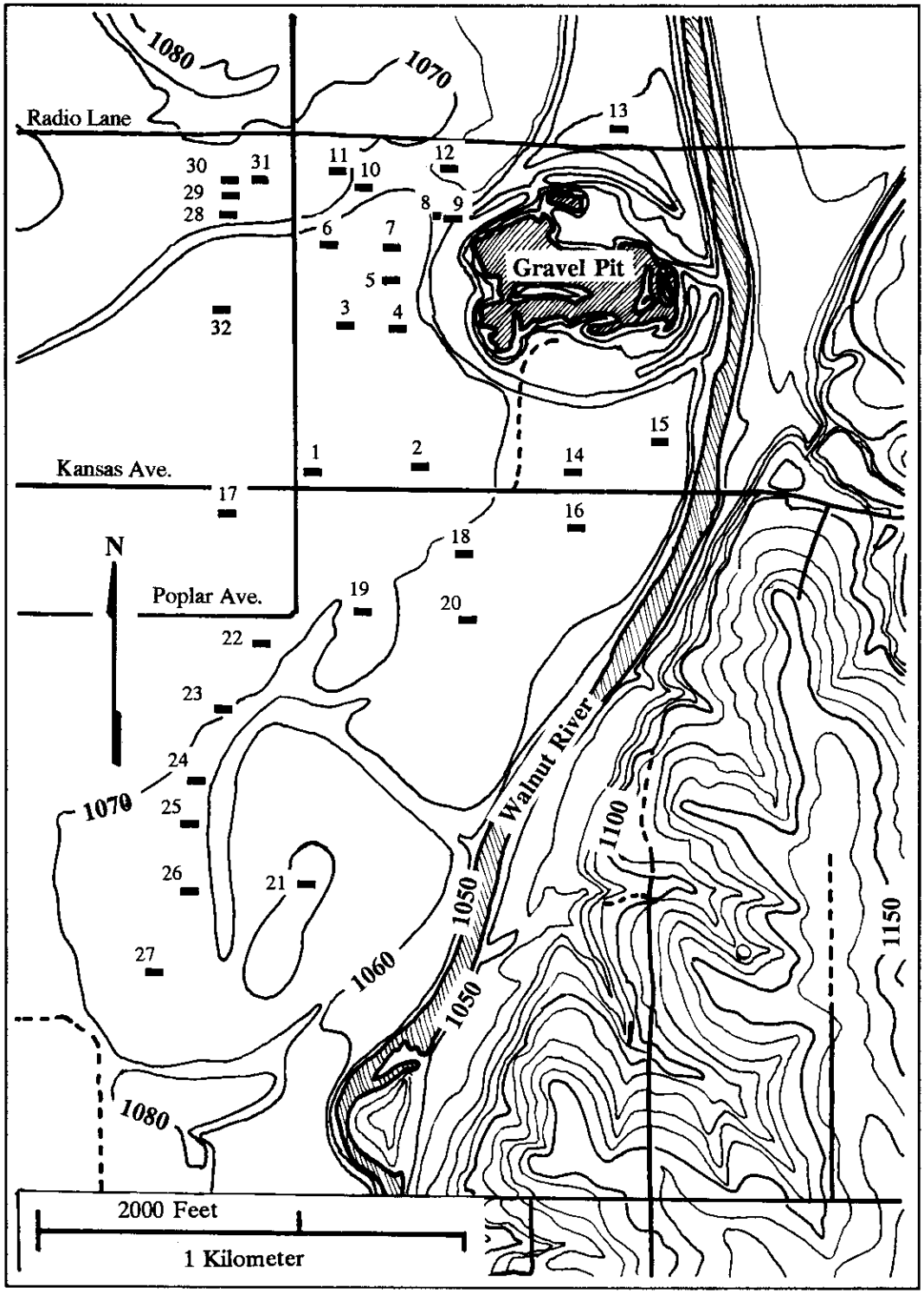

Figure 3. Map showing the locations of backhoe trenches in the project area.

Stratigraphic Nomenclature

A bipartite stratigraphic nomenclature was used in this study. Stratigraphic designations are informal and include allostratigraphic units and soils. Allostratigraphic units are mappable bodies of sediment whose boundaries are laterally traceable disconformities (North American Commission on Stratigraphic Nomenclature 1983). The upper boundary of a unit may be a surface soil or buried soil. Roman numerals designate the allostratigraphic units in the project area, with Unit I designated as the oldest and each successive numeral representing progressively younger units.

Soils were included in the stratigraphic framework of every trench and core that was described in the project area. Soils are important to the subdivision of Quaternary sediments, whether the soils are at the present land surface or buried (Birkeland 1984:325). After soils were identified and described, they were numbered consecutively, beginning with 1 (the modern soil) at the top of the profile.

ALLUVIAL LANDFORMS AND STRATIGRAPHY

Five major alluvial landforms were identified in or near the project area, including three terraces and a modern floodplain. They are designated, in order of decreasing age and elevation, as T-3, T-2, T-1, and T-0 (Figures 4 and 5a). In addition, there is a large alluvial fan at the northern end of the project area. The following discussion describes these landforms and the underlying alluvial deposits.

T-3 Terrace

There is a high, loess-mantled Pleistocene terrace (T-3) on both sides of the Walnut River valley at Arkansas City (Figures 4 and 5a). The elevation of the T-3 surface ranges from about 332.2 to 335.2 m (1,090 to 1,100 feet) above mean sea level (AMSL). The Norge silt loam (Udic Paleustoll) is developed in the loess that covers this high terrace (Horsch 1980). The Norge soil is characterized by a strongly expressed A-Bt profile and a solum that is more than 1.5 m thick. The Bt horizon is reddish brown (5YR 4/4, dry) silty clay loam, and the entire solum is noncalcareous.

Although it is a fairly extensive landform, little if any of the T-3 terrace is within the project area. A small remnant of the T-3 terrace may be present at 14CO386, but this cannot be confirmed until geomorphic investigations are permitted at the site.

T-2 Terrace

The T-2 terrace is a broad, flat, rarely flooded alluvial surface that occurs topographically above the T-1 and T-0 surfaces (Figure 5a). The elevation of the T-2 surface ranges from 326.3 to 327.2 m (1,070.5 and 1,073.5 feet) within the project area. It is a paired terrace at Arkansas City but is sometimes unpaired in other segments of the lower Walnut River valley. A well defined 6-m-high scarp separates the T-2 surface from the loess-mantled T-3 surface. There also is a scarp between the T-2 and T-1 surfaces, but in most places it is a subtle feature with less than .6 m (2 feet) of relief.

In some areas of 14CO544 and 14CO333, two allostratigraphic units were identified beneath the T-2 surface: Units I and II (Figures 5a and 6). Trenches excavated into Unit I revealed clay-rich distal floodplain deposits overlying loamy and fine-sandy near-channel deposits.

The surface soil at the top of Unit I is a strongly developed Mollisol with an A-Bt-Bk-BCk profile. This soil is a moderately well drained Pachic Argiustoll and is mapped as Brewer silty clay loam (Horsch 1980). The Bt horizon is 110 to 135 cm thick and is dark brown (10YR 4/3, dry) to brown (10YR 5/3, dry) noncalcareous silty clay. The Bk horizon is brown (10YR 5/3) silty clay loam with weak carbonate morphology (stage I+). The BCk horizon is brown (10YR 5/3, dry) loam and also has weak carbonate morphology (stage I+).

In some areas Unit I is truncated and overlain by Unit II (Figures 5a and 6). The truncation occurred as a result of the Walnut River simultaneously downcutting and migrating

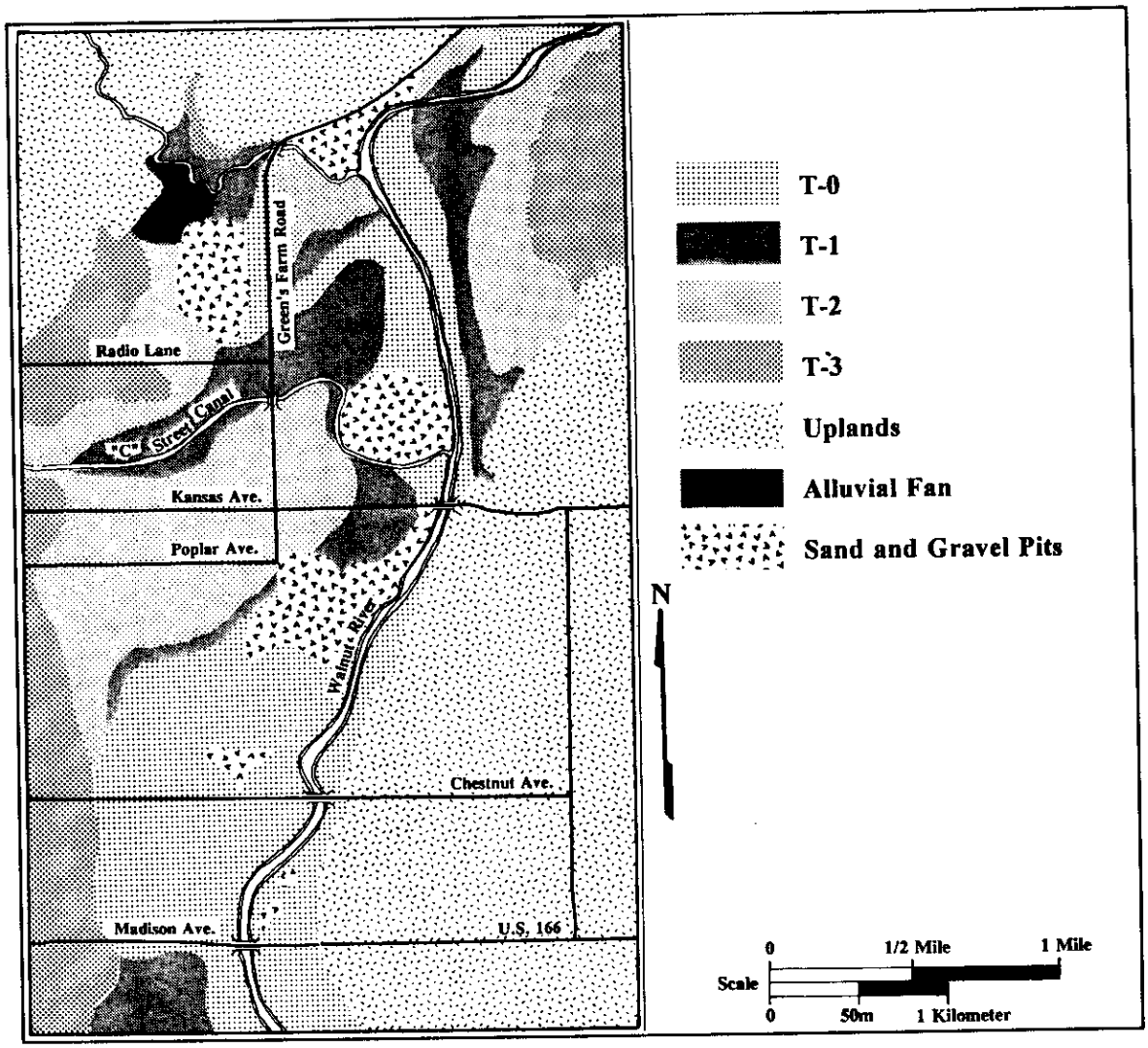

Figure 4. Map showing landforms in the project area.

laterally into Unit I, forming a cut-surface, or strath, at a lower elevation. A well expressed soil with an Ak-Bk profile is developed into the cut-surface. Hence this surface was exposed to subareal weathering for a considerable time before it was buried by Unit II.

Unit II aggraded to the level of the uneroded surface of Unit I (Figure 5a). Unit II has a maximum thickness of 2.25 m and consists of fine-grained overbank deposits that have been altered by pedogenesis. Surface soils formed in Unit II are similar to the Brewer silty clay loam at the top of Unit I. They have a thick, dark grayish brown (10YR 4/2, dry) A horizon above a dark brown (10YR 4/3, dry) to brown (7.5YR 5/4 or 10YR 5/3, dry) noncalcareous Bt horizon. The Bt horizon is 85 to 110 cm thick and has textures ranging from silty clay to silty clay loam. A Bk horizon with weak carbonate morphology (stage I+) is below the Bt horizon. Dark yellowish brown (10YR 4/6, dry) and strong brown (7.5YR 4/6, dry) mottles are common in the Bt and Bk horizons. The mottling is attributed to fluctuating groundwater levels above the clay-rich paleosol underlying Unit II.

T-1 Terrace

The T-1 terrace is an occasionally flooded landform that occurs topographically above the modern floodplain (T-0). The elevation of the

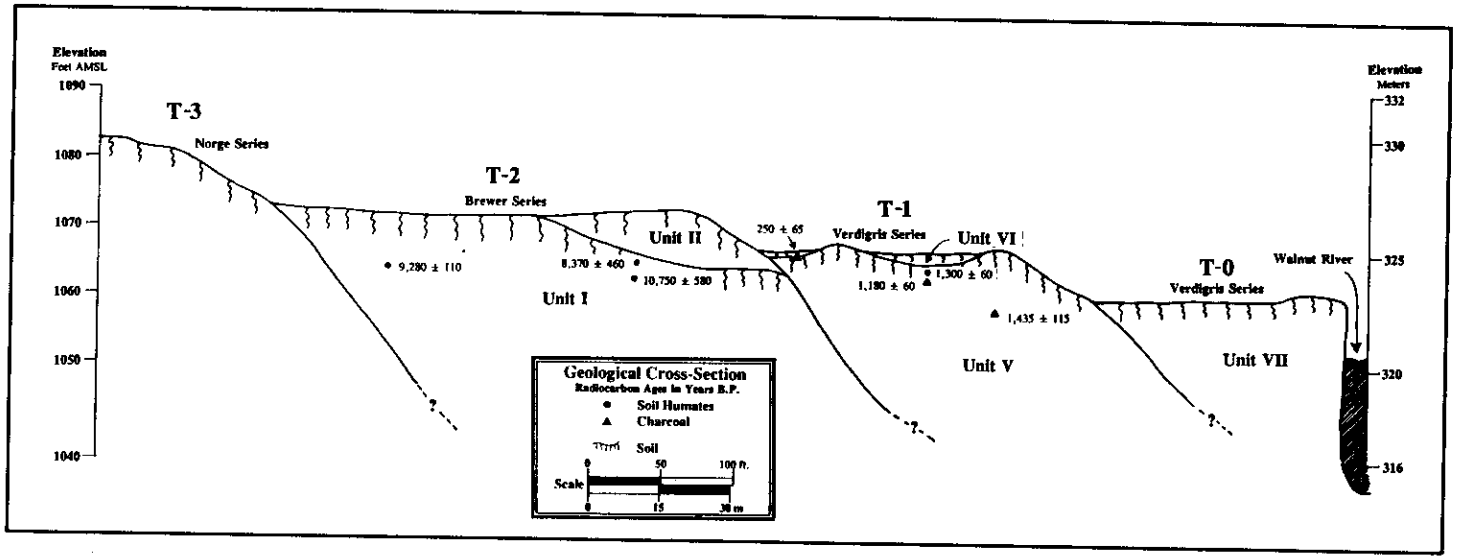

Figure 5a. Cross section of the Walnut River valley in the area of sites 14CO102, 14CO385, 14CO544, and 14CO333.

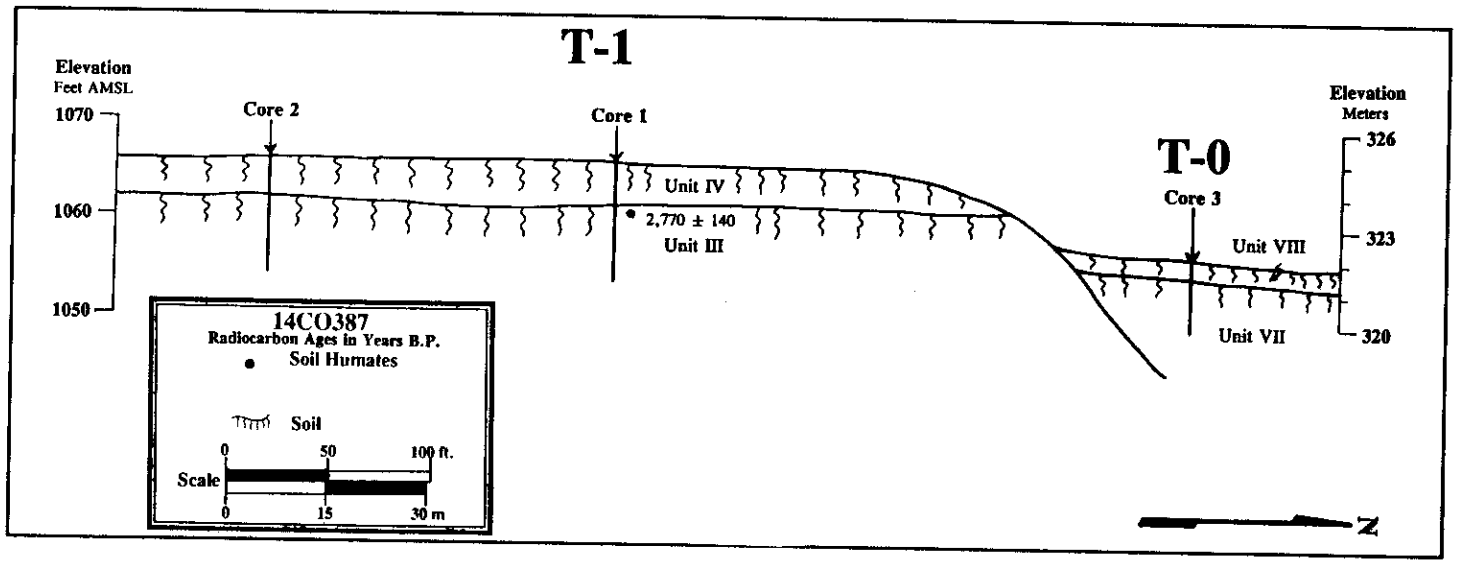

Figure 5b. Cross section of valley fill beneath the T-1 and T-0 surfaces at 14CO387.

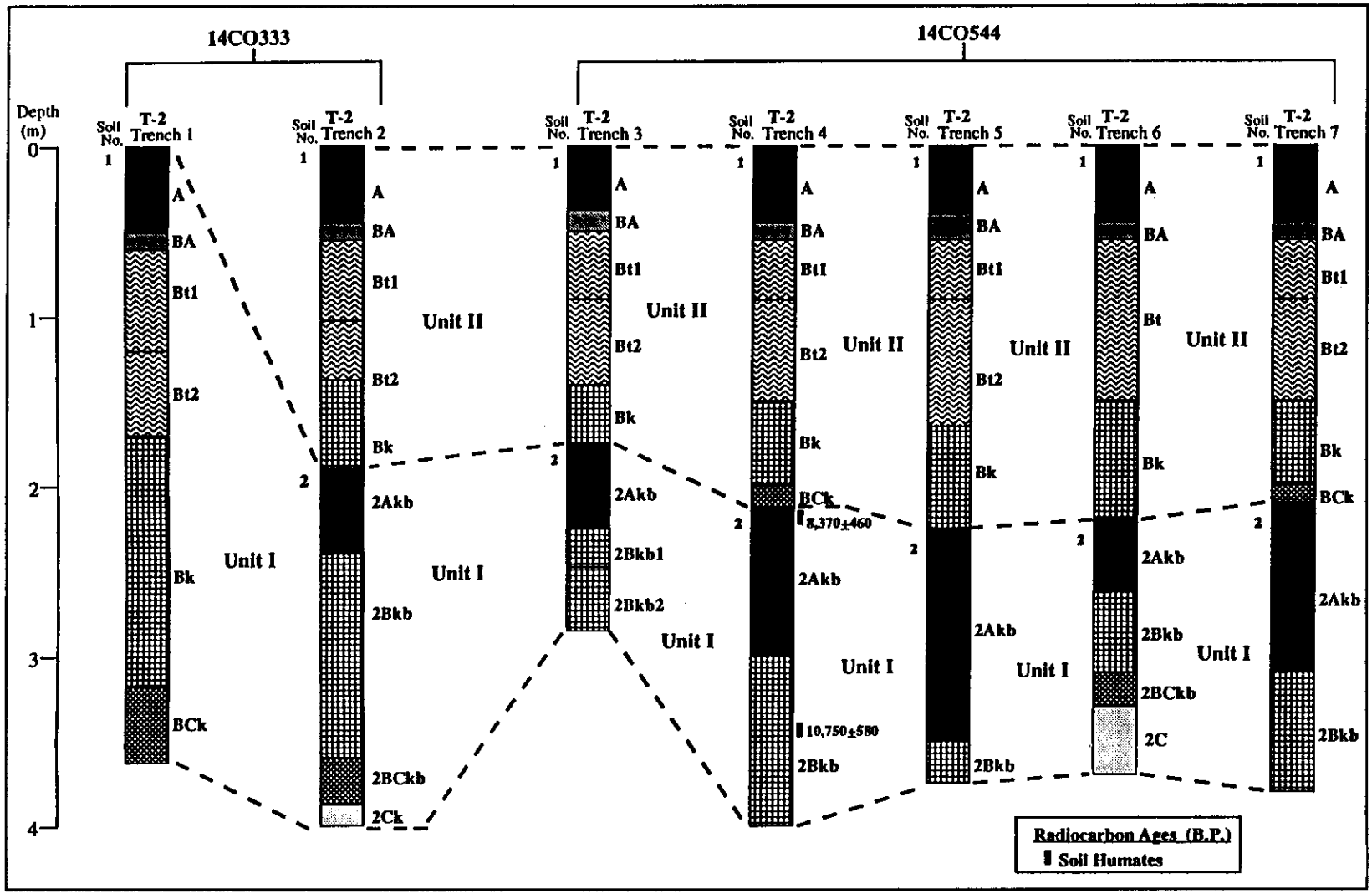

Figure 6. Stratigraphic columns for trenches excavated in T-2 fill at 14CO544 and 14CO333.

T-1 surface ranges from 326.1 to 324.9 m (1,070 and 1,066 feet) AMSL. T-1 is a paired terrace with a well defined 2- to 3-m-high scarp that separates it from the modern floodplain.

The T-1 terrace is differentiated into two surfaces, not on the basis of elevation, but on the presence or absence of channeling or scrolling. For example, at 14CO387 the T-1 surface is relatively flat and featureless (Figure 5b). Cores taken at this site revealed two stratigraphic units beneath the T-1 surface: Units III and IV (Figure 5b). Unit III is the lower of the two units and is composed of fine-grained alluvium. A soil with a strongly expressed A-Bt-Bk profile is developed at the top of Unit III. The 2Ab horizon is 40 cm thick and is very dark gray (10YR 3/1, dry) silty clay loam. The 2Btb horizon is 70 cm thick and is dark brown (10YR 3/3 and 4/3, dry) silty clay loam. Calcium carbonate has been completely leached from the 2Ab and 2Btb horizons and translocated into the 2Bkb horizon. The 2Bkb horizon is 1 m thick and is dark brown (10YR 4/3, dry) silty clay loam. Carbonate morphology does not exceed stage I in the 2Bkb horizon, and the soil matrix is noncalcareous. The 2C horizon is brown (10YR 5/3, dry), calcareous loam grading downward to brown (10YR 5/3, dry), calcareous fine sandy loam. There are thin horizontal beds (laminae) characteristic of flood drapes throughout the 2C horizon.

The absolute age of Unit III is unknown. However, bulk organic carbon from the upper 10 cm of the soil at the top of Unit III was dated to 2,770±140 B.P. Hence sediment composing Unit III was deposited before ca. 2700 B.P.

Unit IV is about 80 cm thick and consists of fine-grained overbank deposits that have been modified by soil genesis. The surface soil developed in Unit IV is a Mollisol with a moderately expressed A-Bt profile. The A horizon is 35 cm thick and is very dark grayish brown (10YR 3/2, dry) to very dark gray (10YR 3/1, dry) silty clay loam. The Bt horizon is about 40 cm thick and is dark brown (10YR 4/3, dry) silty clay. The entire solum is noncalcareous.

The T-1 surface at 14CO330, 14CO331, and 14CO382 also is flat and featureless (Figure 7a). However, Unit III is directly beneath the T-1 surface at these sites. The surface soil at the top of Unit III has an A-Bt profile that fits the description of the Reading silt loam (Typic Argiudoll). The A horizon is 35 to 50 cm thick and is a dark grayish brown (10YR 4/2, dry) silt loam. The Bt horizon is 112 to 130 cm thick and is a dark brown (10YR 3/3, dry) to brown (10YR 5/3, dry) silty clay loam. The C horizon consists of pale brown (10YR 6/3, dry), laminated silt loam and fine sandy loam. The entire solum is leached of calcium carbonate.

The T-1 surface at sites 14CO102, 14CO385, and 14CO544 is not flat and featureless. Instead, it is characterized by distinct ridge-and-swale topography, or scrolling, that is a product of recent stream channeling (Figure 4a). Two stratigraphic units are identified beneath the undulating T-1 surface: Units V and VI (Figures 5a, 7a, and 7b). The lowest unit (Unit V) consists of fine-grained noncalcareous alluvium. Fine sandy loam at the bottom of the exposed sections of Unit V fines upward to silt loam. A buried soil (Soil 2) with A-Bw-BC horizonation is developed in the fine-grained alluvium at the top of Unit V. The 2Ab horizon is about 40 cm thick and is a very dark grayish brown (10YR 3/2, dry) silt loam. The 2Bwb horizon is 40 to 75 cm thick and is a dark brown (10YR 3/3, dry) heavy silt loam to light silty clay loam. Structural development is weak in Soil 2, and there is no evidence of secondary carbonate accumulation. The 2C horizon consists of laminated, noncalcareous silt loam, loam, and fine sandy loam. Radiocarbon ages indicate that the upper 3.5 m of Unit V aggraded between ca. 1450 and 1200 B.P.

The morphology of Soil 2 varies little among the trenches. At 14CO385, however, the 2Ab horizon thins and the 2Bwb horizon thickens to the north. This pattern is attributed to the different positions of the soil on the former active floodplain (now a terrace). Where the soil was proximal to the stream channel, it received frequent influxes of organic-rich alluvium while soil formation was occurring. Although this process of cumulization favors the development of an overthickened A horizon, it inhibits the development of a B horizon (Birkeland 1984:11, 184). Where the soil was

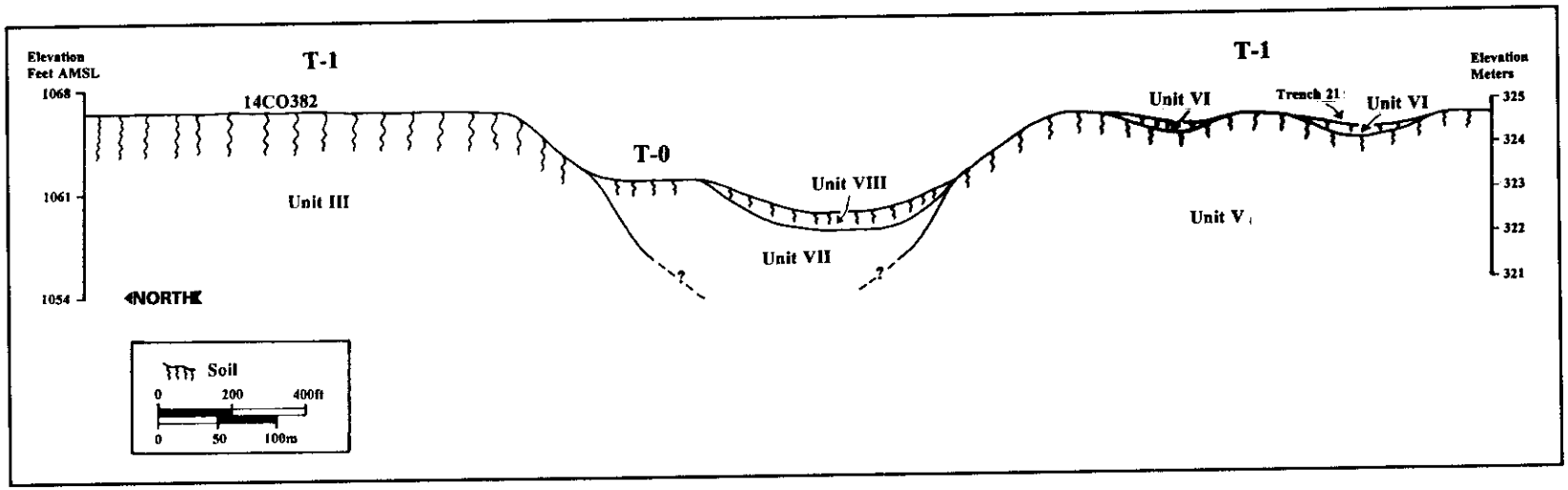

Figure 7a. Cross section of valley fill beneath the T-1 and T-0 surfaces in the area of 14CO330, 14CO331, and 14CO382.

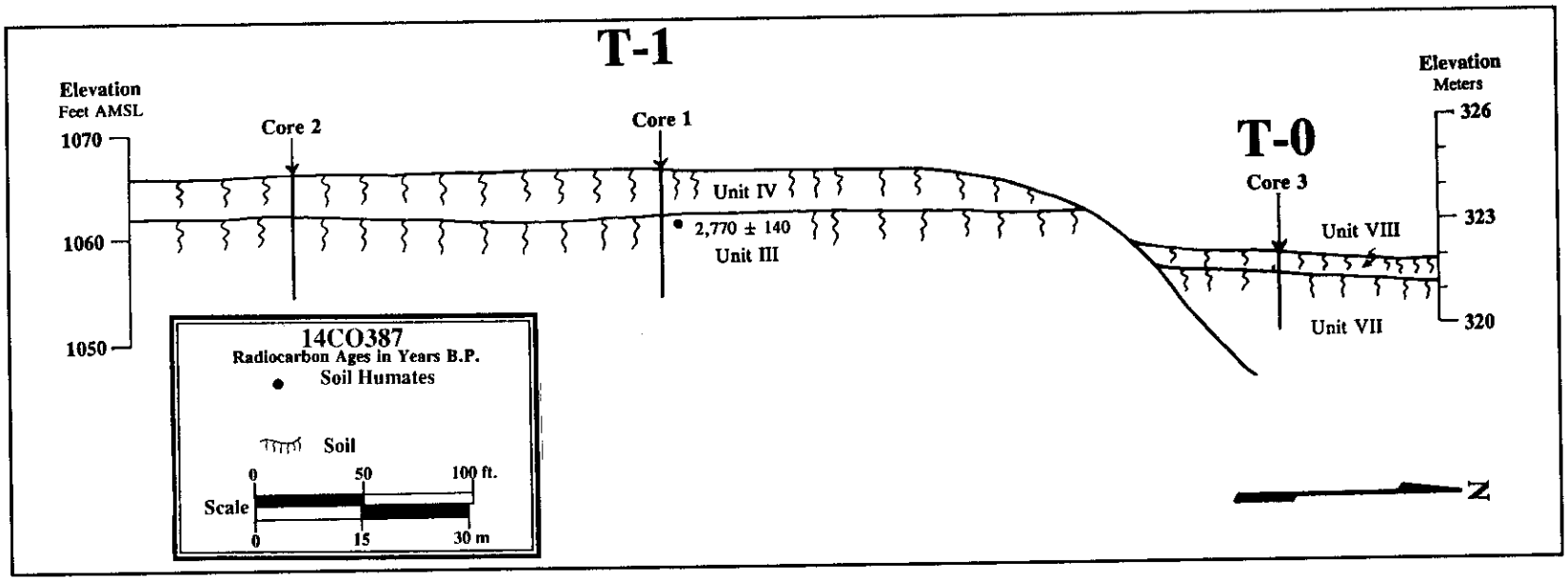

Figure 7b. Cross section of valley fill beneath the T-1 surface at 14CO385.

distal to the stream channel, the A horizon did not receive as much organic-rich alluvium and hence did not become overthickened. Instead, the greater landscape stability of distal portions of the floodplain favored the development of a thicker B horizon.

At some localities Unit V is mantled by overbank deposits that compose Unit VI. The thickness of Unit VI varies from 1.3 m to less than 10 cm. Where Unit I is more than 50 cm thick, a Cumulic Hapludoll (Verdigris series) with an A-AC profile is developed at the top of the unit. The A horizon is usually overthickened and consists of noncalcareous dark grayish brown (10YR 4/2, dry) to dark brown (10YR 3/3, dry) silt loam. At locations where Unit VI is less than 50 cm thick, the surface soil has an Ap-A profile. Radiocarbon ages indicate that Unit VI is less than about 250 years old.

Based on the geomorphic and stratigraphic evidence presented above, T-1 is best described as a terrace complex. The T-1 fill is not characterized by a simple sequence of vertically stacked alluvial deposits. Although there is superposed stratigraphy, the older T-1 units (Units III and IV) have been cut out in some places and replaced by younger units (Units V and VI). Because the younger units aggraded to the same elevation as the ones they truncated, the age of the valley fill varies horizontally as well as with depth below what appears to be the same geomorphic surface.

Modern Floodplain (T-0)

The modern floodplain is a frequently flooded alluvial surface that occurs topographically below the T-1 terrace. It is limited to the modern meander belts and channels and represents the active constructional surface of the Walnut River. The elevation of the T-0 surface ranges from 323.4 to 324.6 m (1,061 and 1,065 feet) AMSL within the project area.

Two stratigraphic units are identified beneath the T-0 surface: Units VII and VIII. Unit VII is the lower of the two units and consists of silt loam grading downward to stratified loam, fine sandy loam, loamy fine sand, and fine sand. The surface soil at the top of Unit VII is a Cumulic Hapludoll (Verdigris series) with an A-AC profile. The A horizon is nearly 1 m thick and is grayish brown (10YR 5/2, dry) to dark brown (10YR 4/3, dry), noncalcareous silt loam. The AC horizon is 20 cm thick and is brown (10YR 5/3, dry) silt loam. Alluvium below the AC horizon is brown (10YR 5/3, dry) to pale brown (10YR 6/3, dry) and is calcareous.

Unit VIII was observed above Unit VII in abandoned channels (Figure 7a). Unit VIII is 60 to 170 cm thick and is composed of fine-grained flood deposits. A soil with Ap-A or A-C horizonation is developed at the top of Unit VIII. The Ap and A horizons consist of very dark grayish brown (10YR 3/2, dry) and dark brown (10YR 3/3, dry), noncalcareous silty clay loam, respectively. The C horizons consist of stratified noncalcareous silt loam, fine sandy loam, and loamy fine sand.

Alluvial Fan

A large alluvial fan is located north of Radio Lane at 14CO1 (Figure 4). The fan developed at the mouth of a small, unnamed stream that flows out onto the valley floor of the Walnut River. The fan has a lobate surface with elevations ranging between 329.2 and 330.4 m (1,080 to 1,084 feet) AMSL. The soils, stratigraphy, and age of the fan are unknown because subsurface investigations were not permitted at the site. However, based on geomorphic evidence from other alluvial fans in the region, it probably developed during the early and middle Holocene (ca. 9000 to 4000 B.P.) and may contain multiple buried soils. Deep cores will be taken at the fan during the next stage of the geoarcheological investigation.

ALLUVIAL CHRONOLOGY

Twelve radiocarbon ages were obtained on charcoal and bulk organic carbon from alluvial settings during the course of this investigation (Table 1). These ages shed new light on the alluvial chronology of the lower Walnut River. Also, the findings of this study can be compared with alluvial chronologies of other streams in the region.

Table 1. Radiocarbon Ages from the Project Area.

Site No.	Landform	Alluvial Fill	Material Assayed	Depth Below Surface (m)	^{14}C Age (Yr. B.P.)	$\delta^{13}C$ Value	$\delta^{13}C$ Corrected Age (Yr. B.P.)	Lab No.
14CO544	T-2 terrace	I	Soil	3.40-3.60	NR*	-17.6	10,750±580	GX-16434
14CO1510	T-2 terrace	I	Soil	2.50-2.60	9,170±110	-17.9	9,280±110	Beta-59872
14CO544	T-2 terrace	I	Soil	2.10-2.30	NR*	-19.3	8,370±460	GX-16435
14CO387	T-1 terrace	III	Soil	0.80-0.90	NR*	-15.2	2,770±140	GX-19306
14CO102	T-1 terrace	V	Soil	0.60-0.80	NR*	-19.6	1,700±200	GX-16436
14CO544	T-1 terrace	V	Charcoal	3.40-3.50	NR*	-25.4	1,435±115	GX-16437
14CO385	T-1 terrace	V	Soil	0.57-0.67	1,200±60	-19.0	1,300±60	Beta-59871
14CO385	T-1 terrace	V	Charcoal	1.20-1.30	1,170±60	-19.0	1,180±60	Beta-59870
14CO330	T-1 terrace	III	Charcoal	SF**	NR*	-25.2	625±105	GX-17021
14CO330	T-1 terrace	III	Charcoal	SF**	NR*	-24.4	560±100	GX-17020
14CO102	T-1 terrace	V	Charcoal	ca. 0.50	NR*	-21.9	390±125	GX-17022
14CO102	T-1 terrace	V	Charcoal	ca. 0.50	NR*	-25.3	250±65	GX-17023

*NR: Not Reported **SF: Charcoal was recovered from a cultural feature that extended from the land surface down through the modern soil.

Radiocarbon assays suggest that most of the valley fill beneath the T-2 terrace aggraded during the Wisconsinan. Radiocarbon ages of 10,750±580, 9280±110, and 8370±460 B.P. were determined on bulk organic carbon recovered at depths of 3.40-3.60, 2.50-2.60, and 2.10-2.30 m below the T-2 surface, respectively. The youngest age is from the A horizon of a buried soil developed on a surface cut in Unit I of the T-2 fill. The suite of ages suggest that aggradation of Unit I slowed during the Pleistocene-Holocene transition, and soil development was underway at the top of Unit I by at least ca. 10,750 B.P. Portions of Unit I were cut out sometime after ca. 10,750 B.P., and soil development was occurring on the cut-surface at ca. 8370 B.P. The cut-surface was mantled by Unit II soon after ca. 8370 B.P.

The timing of the downcutting event that left the late-Wisconsinan floodplain as the T-2 terrace is unknown. However, based on the alluvial records of other large streams in the Central Plains, it probably occurred between ca. 11,000 and 10,500 B.P. Channel incision at that time would have isolated the late-Wisconsinan floodplain from frequent flooding, thereby allowing soil development to begin in the upper part of Unit I.

The alluvial history of the Walnut River from ca. 8000 to 2700 B.P. remains unknown. However, there is strong evidence for aggradation in large stream valleys throughout the Central Plains during the middle and early late Holocene (Mandel n.d.). Dateable material must be recovered from the upper part of Unit II and near the bottom of Unit III to determine whether that pattern holds true in the lower Walnut River valley.

The T-1 terrace complex is a product of cutting and filling during the late Holocene. Unit III is the oldest package of alluvium that has been identified beneath the T-1 surface. Bulk organic carbon from the upper 10 cm of a soil developed at the top of Unit III yielded a radiocarbon age of 2770±140 B.P. At 14CO387 Unit III was mantled by flood deposits (Unit IV) soon after ca. 2770 B.P. However, at many sites Unit III was cut out prior to accumulation of Unit V. Radiocarbon ages determined on charcoal indicate that sediment composing the upper 3.5 m of Unit V accumulated between ca. 1450 and 1200 B.P., and soil development was underway at the top of this unit soon after 1200 B.P.

The weakly expressed A-Bw soil profile at the top of Unit V appears to be a product of a relatively short episode of floodplain stability. This interpretation is supported by the radiocarbon assays. At 14CO385 charcoal, recovered from a layer of carbonized wood fragments in the lower portion of the 2Bwb2 horizon, yielded a radiocarbon age of 1180±60 B.P., and bulk organic carbon from the upper 10 cm of the 2Ab horizon was dated to 1300±60 B.P. (Figure 6b). In addition, charcoal from the 2C horizon in Unit V at 14CO544 (Trench 9) yielded a radiocarbon age of 1435±115 B.P., and bulk organic carbon from the upper 10 cm of the 2Ab horizon at 14CO102 (Trench 10) was dated to 1700±200 B.P. The slightly greater ages determined on bulk organic carbon are attributed to the deposition of alluvium that was enriched with older carbon. The older carbon may have been derived from eroded upland soils and/or fluvially reworked valley fill. Hence the charcoal ages are considered to be more accurate than the bulk carbon ages. Charcoal from cultural features in the 2Ab horizon at the top of Unit V yielded radiocarbon ages of 390±125 and 250±65 B.P. These ages, combined with the charcoal ages from 14CO385 and 14CO544, indicate that Unit V was aggrading between ca. 1450 and 1200 B.P. Aggradation ceased and soil development was underway very soon after ca. 1200 B.P. and continued until at least ca. 250 B.P. Unit V was mantled in some areas by Unit VI after ca. 250 B.P.

The absolute age of the valley fill beneath the modern floodplain (T-0) is unknown since no radiocarbon ages were obtained for Units VII and VIII. However, based on radiocarbon ages determined on materials from the adjacent T-1 fill and from floodplain deposits in other tributaries of the Arkansas River, alluvium composing Unit VII probably began to accumulate soon after ca. 1000 B.P., and it is likely that Unit VIII consists of post-settlement (Historic) alluvium. Weak soil development

(A-C horizonation) at the top of the T-0 fill supports this interpretation.

Regional Correlations

Although the alluvial chronology of the lower Walnut River has not been completely resolved, the temporal distribution of the ages from buried soils in the project area fits the regional pattern. As noted earlier, aggradation of the T-1 fill in the lower Walnut River valley was interrupted by at least three episodes of landscape stability during the late Holocene. These episodes are evidenced by soils at the top of units III, IV, and V. Humates from the upper 10 cm of the soil at the top of Unit III date to ca. 2700 B.P. While this age does not indicate when alluviation ceased and soil development began, it suggests that the soil at the top of Unit III was buried by levee deposits (Unit IV) soon after ca. 2700 B.P. The surface soil at the top of Unit IV began to develop sometime after 2700 B.P., and it is still developing today. Following an episode of cutting and filling, soil development was underway at the top of Unit V soon after ca. 1200 B.P. This soil is still forming today in some places, but it was buried by overbank deposits (Unit VI) that accumulated in swales on the T-1 surface.

In the East Branch Walnut River valley near El Dorado, Artz (1983) determined that the Snyder Soil formed in T-1 fill between 4000 and 2000 B.P. and that it was buried by levee deposits after ca. 2000 B.P. Buried alluvial soils dating to ca. 2700 B.P. have been documented in several other major drainage systems in southeastern Kansas, including the Whitewater River basin (Mandel 1992a), the Verdigris River basin (Mandel 1993a), and the Neosho River basin (Mandel 1993a). In southwestern Kansas the Hackberry Creek paleosol developed in T-1 fill of the Pawnee River between ca. 2800 and 2400 B.P. (Mandel 1992b). In north-central Kansas near Kanopolis Lake, humates from buried soils developed in T-1 fill of the Smoky Hill River and Ash Creek yielded radiocarbon ages of 2620±80 and 2620±70 B.P., respectively (Mandel 1992b). Also, Johnson and Martin (1987) reported a radiocarbon age of 2620±70 B.P., determined on humates from a buried soil in the lower Kansas River valley near Topeka, Kansas. In northeastern Kansas humates from a buried soil developed in valley fill of the upper Delaware River yielded a radiocarbon age of 2600±90 B.P. (Mandel et al 1991). In south-central Nebraska near Harlan County Lake, humates from a buried soil developed in T-1 fill of the Republican River were dated at 2780±80 B.P. (Martin 1992).

The initiation of soil development at the top of Unit V soon after 1200 B.P. corresponds well with findings in the upper Walnut River basin. A buried soil with A-Bw horizonation was documented near the top of the T-1 fill of the Little Walnut River near El Dorado (Mandel 1993a). Humates from the lower and upper 10 cm of the buried A horizon yielded radiocarbon ages 1200 and 750 B.P., respectively. In a detailed study of the East Branch Walnut River, Artz (1983) determined that the Nuttal Soil developed on the valley floor between ca. 1500 and 1000 B.P.

An episode of soil development dating to ca. 1200 B.P. also has been documented outside the Walnut River basin. For example, in northeastern Oklahoma the Copan paleosol developed in T-1 fill of the Verdigris River and its tributaries between ca. 1550 and 650 B.P. (Artz and Reid 1984; Hall 1977a, 1977b). In the southeast corner of Kansas, humates from the upper 10 cm of a buried soil developed in T-1 fill of the Neosho River yielded a radiocarbon age of 1280±70 B.P. In southwestern Kansas the Buckner Creek paleosol developed in T-1 fill of the Pawnee River between ca. 1300 and 1000 B.P. (Mandel 1992). Also, soil development was underway at ca. 1200 to 1000 B.P. on a number of valley floors within the Kansas River basin, including those of the Kansas River (Johnson and Martin 1987), the Delaware River (Johnson 1989; Mandel et al. 1991), the Wakarusa River (Mandel 1987), Alum Creek (Mandel 1992b), and Wolf Creek (Arbogast 1991).

Based on a single radiocarbon assay, soil development was occurring on the valley floor of the Walnut River at around 8370±460 B.P. As noted earlier, this age was determined on bulk organic carbon from the upper 20 cm of the buried soil developed on the cut-surface of Unit

I. Similar ages have been reported for buried alluvial soils at only two localities in the Central Plains. In central Nebraska humates from a buried soil developed in valley fill at Cooper's Canyon yielded a radiocarbon age of 8300±200 B.P. (May 1991). Also, Johnson and Martin (1987) reported a radiocarbon age of 8310±120 B.P. determined on humates from a buried soil developed in valley fill of the lower Kansas River near Wamego, Kansas.

The initiation of soil development in the upper part of Unit I (T-2 fill) at around 10,750±580 B.P. is consistent with the alluvial chronologies of several other large streams in the Central Plains. For example, humates from buried soils developed in valley fill of the Solomon River and Wolf Creek in north-central Kansas were dated to 10,580±120 and 10,580±140 B.P., respectively (Johnson and Martin 1987; May 1993). In southwestern Kansas humates from deeply buried soils developed in T-1 fill of the Pawnee River yielded radiocarbon ages of 10,240±120 and 10,100±130 B.P. (Mandel 1992). In northeastern Kansas near the town of Bonner Springs, humates from a buried soil developed in valley fill of the Kansas River yielded a radiocarbon age of 10,430±130 B.P. (Holien 1982). Also, May (1991) reported a radiocarbon age of 10,290±170 B.P. determined on humates from a buried soil developed in valley fill at Cooper's Canyon in central Nebraska.

The similarities in alluvial stratigraphic records are attributed to broadly similar activities of streams throughout the Central Plains during the Holocene. Major climatic changes appear to be the underlying cause behind synchronous patterns of fluvial activity that are detected in the stratigraphic records of streams in the region. However, extrinsic and intrinsic factors in the fluvial system interact to produce periods of stability and instability that may be detected in the stratigraphic record of one stream but not in that of another.

GEOLOGIC POTENTIALS FOR BURIED CULTURAL DEPOSITS

As noted in the preceding discussion, alluvial deposits dating to different periods of the late Quaternary are preserved beneath various geomorphic surfaces in the Walnut River valley at Arkansas City. This information, combined with soil-stratigraphic data, may be used to direct future archeological research in the project area. Specifically, the results of this study allow one to predict where buried archeological materials for each cultural period are likely to occur in the valley landscape (Table 2; cf. Bettis and Benn 1984:223).

The determination of geologic potentials for buried cultural deposits is largely based on the paleosol record. Buried paleosols represent previous land surfaces that were stable long enough to develop recognizable soil profile characteristics. As Hoyer (1980) pointed out, if one assumes that the probability of human use of a particular landscape position was equal for each year, it follows that the surfaces which remained exposed for the longest time would represent those with the highest probability for containing cultural materials. Because the buried paleosols identified in the project area represent these surfaces, evidence for occupation would most likely be associated with them. It is important to note, however, that buried cultural deposits, even rich ones, also may be found in sediment that has not been modified by soil development (Hoyer 1980). Hence the presence/absence of buried paleosols cannot be used as the sole criterion for evaluating the potentials for buried cultural materials. The mere presence of Holocene deposits beneath a geomorphic surface offers some potential for buried cultural materials.

Modern Floodplain (T-0)

The results of this investigation suggest that there is low geologic potential for cultural materials predating the Late Prehistoric in T-0 deposits (Table 2). Although the absolute age of the valley fill beneath the modern floodplain is unknown, Unit VII probably is less than 1,000 years old, and Unit VIII resembles Historic alluvium identified elsewhere in southeastern Kansas (see Mandel 1993a, 1993b). The presence of weakly developed surface soils (A-AC-C profiles) on the modern floodplain indicates that this geomorphic surface is very young. Also, bedding is well preserved at

Table 2. Geologic Potentials for Buried Cultural Deposits.

Cultural Periods	Landforms			
	T-O	T-1	T-2	T-3
Paleoindian	-	-	+++	+
Early Archaic	-	?	+++	-
Middle Archaic	-	?	?	-
Late Archaic	-	+++	-	-
Plains Woodland	+	+++	-	-
Late Prehistoric	++	+++	-	-
Historic	+++	+++	-	-

\+ Low Potential ++ Moderate Potential +++ High Potential - Impossible

shallow depths, and no buried soils were observed in Unit VII. Hence floodplain aggradation has been fairly rapid over the past 1,000 years. It is reasonable to assume that such a frequently flooded geomorphic setting would have been unfavorable for long-term human occupation. Although people may have occasionally exploited seasonal floodplain resources, it is unlikely that short-term extractive camps would have left a significant cultural record.

T-1 Terrace

There is high geologic potential for buried prehistoric cultural deposits in valley fill beneath the surfaces of the T-1 terrace complex. However, one must be cautious in predicting the age of buried cultural materials associated with T-1 deposits at different localities. As noted earlier, the age of the valley fill varies horizontally as well as with depth below what appears to be the same geomorphic surface. In the absence of subsurface testing, only the topography of the terrace complex can be used to predict the age of cultural materials that might be found on or within this landform-sediment assemblage at any locality. For example, where the T-1 surface is characterized by ridge-and-swale topography, Woodland and more recent cultural affiliations are likely to be associated with Unit V. Radiocarbon ages indicate that the soil at the top of Unit V developed soon after ca. 1200 B.P. and was mantled in some places by alluvium composing Unit VI soon after ca. 250 B.P. Great Bend cultural materials have already been documented in this buried soil at 14CO385 and 14CO102.

Where the T-1 terrace is relatively flat and featureless, either Unit III or IV occurs immediately below its surface. These stratigraphic units are older than Unit V and may contain cultural materials that predate the Woodland period. Bulk organic carbon from a well developed soil at the top of Unit III yielded a radiocarbon age of ca. 2700 B.P. Although this soil is at the surface in some areas, it is mantled by overbank deposits (Unit IV) at 14CO387. Hence there may be Late Archaic materials on or within the buried soil, and older cultural materials may occur below it.

T-2 Terrace

There is high geologic potential for buried Paleoindian and Early Archaic materials beneath portions of the T-2 surface. Specifically, these cultural materials may be associated with the buried soil developed on the erosional surface cut in Unit I at 14CO544 and 14CO333. Radiocarbon ages determined on bulk organic carbon suggest that this soil developed on the

cut-surface sometime after 10,750 B.P. and was mantled by Unit II after ca. 8400 B.P.

Paleoindian materials also may be found in Unit I, where it has not been truncated by Unit II. However, the potential for buried cultural deposits is relatively low in these geomorphic settings. This interpretation is based on temporal and stratigraphic data. Most, if not all, of Unit I aggraded before ca. 10,750 B.P., and no buried soils were observed in the upper 4 m of this body of sediment.

SUMMARY AND CONCLUSIONS

This paper has described the nature of the landscape in the lower Walnut River valley at Arkansas City and focused on the soil-stratigraphy and chronology of alluvial deposits composing landform-sediment assemblages in the project area. The Walnut River valley is a complex mosaic of geomorphic surfaces and deposits, ranging in age from Pleistocene to latest Holocene.

Five landform-sediment assemblages are identified in the project area. The lowest and youngest landform-sediment assemblage is the modern floodplain (T-0). Two stratigraphic units are identified beneath the T-0 surface: Units VII and VIII. Unit VII consists of stratified sandy and loamy alluvium that grades upward to fine-silty alluvium, and an A-AC-C soil profile is developed at the top of the unit. Unit VIII is composed entirely of fine-grained overbank alluvium and is restricted to abandoned channels cut in Unit VII. The surface soil at the top of Unit VIII is characterized by a thick cumulic A horizon. The absolute ages of these two units are unknown. However, alluvium composing Unit VII probably began to accumulate soon after ca. 1000 B.P., and it is likely that Unit VIII consists of post-settlement (Historic) alluvium. The potential for finding prehistoric cultural deposits in situ beneath the T-0 surface is considered low because the floodplain appears to have been an unstable geomorphic setting for the past 1,000 years.

Two Holocene terraces were identified above the modern floodplain of the Walnut River: a low terrace (T-1) and a slightly higher terrace (T-2). T-1 is a terrace complex with a surface that varies in age across the valley floor. Four stratigraphic units were identified beneath the T-1 surface: Units III, IV, V, and VI. The upper 2.5 m of Unit III consist of fine-grained overbank deposits. Fine sandy loam at the bottom of exposed sections of Unit III grades upward to silt loam, and a soil with A-Bt-Bk horizonation is developed at the top of the unit. The surface of Unit III is the T-1 surface at some sites in the project area. However, at 14CO387 Unit III is mantled by Unit IV. Unit IV is 77 to 80 cm thick and consists of fine-grained overbank deposits. A soil with A-Bt horizonation is developed through the entire body of sediment that composes Unit IV. The absolute ages of Units III and IV are unknown. However, a radiocarbon age of ca. 2700 B.P. was determined on bulk organic carbon from the soil developed at the top of Unit III. Based on this age, Units III and IV aggraded before and after ca. 2700 B.P., respectively.

As the Walnut River and its tributaries migrated laterally during the late Holocene, Units III and IV were cut out in some areas. This episode of cutting was followed by the accumulation of sediment that composes Unit V. The T-1 surface is characterized by ridge-and-swale topography, or scrolling, where cutting and filling have occurred. The upper 2 m of Unit V consist of fine-grained overbank deposits, and there is a soil with A-Bw horizonation at the top of the unit. This soil usually is at or very near the land surface on topographic highs of the T-1 terrace, but it is mantled by Unit VI in the low areas. Unit VI consists of recent flood deposits that have been slightly modified by soil development (A-AC profile). Radiocarbon assays indicate that sediment composing the upper 3.5 m of Unit V accumulated between ca. 1450 and 1200 B.P., and soil development was underway at the top of this unit soon after 1200 B.P. Unit VI aggraded soon after ca. 250 B.P.

There is high geologic potential for buried prehistoric and historic cultural resources in the T-1 fill, especially where Unit V is mantled by Unit VI. Specifically, Woodland and more recent cultural affiliations may be associated with

the buried soil at the top of Unit V. Also, the potential for buried prehistoric cultural deposits is high where Unit III is mantled by Unit IV. Late Archaic materials may be on and within the buried soil at the top of Unit III, and older cultural deposits may occur below this soil.

The T-2 terrace is a broad, flat surface about .5 m higher than the T-1 terrace. Most of the T-2 surface is underlain by Unit I. Fine sandy loam at the bottom of exposed sections of Unit I grades upward to silty clay loam, and a surface soil with A-Bt-Bk horizonation is at the top of the unit. Radiocarbon assays indicate that this soil began to develop around 10,750 B.P. Hence aggradation of Unit I ceased during the Pleistocene-Holocene transition.

In some areas east of Green's Farm Road and north of Kansas Avenue, the Walnut River simultaneously downcut and migrated laterally into Unit I, forming a cut-surface at a lower elevation. A soil with an Ak-Bk profile developed on the cut-surface and was mantled by Unit II sometime after ca. 8370 B.P. Unit II aggraded to the level of the uneroded surface of Unit I. Hence elevation cannot be used to distinguish areas of the T-2 terrace that are underlain by Unit I from those that are underlain by Unit II.

Unit II has a maximum thickness of 2.25 m and consists of fine-grained overbank deposits. The surface soil at the top of Unit II has a well expressed A-Bt-Bk profile. The absolute age of Unit II is unknown. However, based on radiocarbon ages from Units I and III, alluvium composing Unit II accumulated sometime between ca. 8300 and 2800 B.P.

There is high geologic potential for buried Early Archaic and Paleoindian materials in the T-2 fill. Early Archaic materials are most likely to be associated with the buried soil developed on the cut-surface at the top of Unit I, and older cultural deposits may occur below the paleosol. Also, Paleoindian materials may be in Unit I, where it has not been truncated by Unit II.

There is a high, loess-mantled Pleistocene terrace (T-3) in the Walnut River valley at Arkansas City, but little if any of this landform is within the project area. A small remnant of the T-3 terrace may be present at 14CO386, but this cannot be confirmed until geomorphic investigations are allowed at the site. Nevertheless, the potential for deeply buried cultural materials in the Pleistocene loess and underlying T-3 valley fill is considered low.

Finally, a large, low-angle alluvial fan was identified at the northern end of 14CO1. The fan developed at the mouth of a small, unnamed stream that flows out onto the valley floor of the Walnut River. Geomorphic investigations have not yet been conducted at the fan. However, based on chronostratigraphic evidence from other alluvial fans in the Central Plains, this landform probably developed during the early and middle Holocene (ca. 9000 to 4000 B.P.). It is important to note that alluvial fans often contain deeply buried cultural resources (see Bettis 1990; Hajic 1990; Mandel 1990b, 1992b). Hence the fan at 14CO1 will be the focus of future geoarcheological investigations.

The history of Holocene landscape evolution stored in the valley fill of the lower Walnut River is complex and fragmentary; not all erosional or depositional events are preserved at one location or, necessarily, among several locations in the project area. Despite this problem, enough information is available to allow the archeologists to concentrate testing efforts in potentially productive areas. For example, a search for Late Woodland and younger cultural materials should focus on the buried soil at the top of Unit III. This soil is easy to recognize, and it is a useful stratigraphic marker in the late-Holocene valley fill beneath undulating surfaces of the T-1 terrace. However, no additional survey or testing is needed on the modern floodplain (T-0). The floodplain has been a very unstable geomorphic setting since the beginning of T-0 aggradation, and much of the T-0 fill appears to be too young to contain prehistoric cultural materials.

The three-dimensional landscape analysis used in this study has yielded information that helps explain certain aspects of the archeological record. However, there are some unanswered questions. For example, why have no early sites, especially those dating to the Altithermal (8000

-5000 B.P.), been documented in the project area? Were people living on the uplands or in other regions during this period, or did geologic processes affect this part of the archeological record by either removing or burying Early and Middle Archaic cultural deposits? Until additional chronostratigraphic data are collected in the project area, these questions cannot be answered. The time depth of the valley fill beneath the T-1 terrace complex is unknown, and the alluvial fan at 14CO1, which is the most likely setting for deeply buried Archaic materials, has not been studied. As geomorphic investigations continue in the project area, apparent gaps in the archeological record may be filled, and a better understanding of the relationship between prehistoric people and the landscape can be gained.

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REFERENCES

Arbogast, A. F.
1991 *Late-Quaternary Evolution of a Small Basin in the Kansas River System: Wolf Creek.* . Unpublished Master's thesis, Department of Geography, University of Kansas, Lawrence.

Artz, J. A.
1983 *The Soils and Geomorphology of the East Branch Walnut Valley: Contexts of Human Adaptation in the Kansas Flint Hills.* Unpublished Master's thesis, Department of Anthropology, University of Kansas, Lawrence.

Artz, J. A., and K. C. Reid
1984 Geoarchaeological Investigations in Cotton Creek Valley. In *Hunters of the Forest Edge: Culture, Time, and Process in the Little Caney Basin*, edited by K. C. Reid and J. A. Artz, pp. 97-186. Contributions in Archaeology No. 14. Laboratory of Archaeology, University of Tulsa, Tulsa, Oklahoma.

Bayne, C. K.
1962 *Geology and Ground-Water Resources of Cowley County, Kansas.* Bulletin 158. Kansas Geological Survey, Lawrence.

Bettis, E. A. III
1990 *Holocene Alluvial Stratigraphy and Selected Aspects of the Quaternary History of Western Iowa.* Contribution No. 36. Iowa Quaternary Studies Group, Midwest Friends of the Pleistocene, University of Iowa, Iowa City.

Bettis, E. A. III, and D. W. Benn
1984 An Archaeological and Geomorphological Survey in the Central Des Moines River Valley, Iowa. *Plains Anthropologist* 29:211-226.

Birkeland, P. W.
1984 *Soils and Geomorphology.* Oxford University Press, Oxford.

Bradley, L. E.
1973 *Subsistence Strategy at a Late Archaic Site in South-Central Kansas.* Unpublished Master's thesis, Department of Anthropology, University of Kansas, Lawrence.

Campbell, C. A., E. A. Paul, D. A. Rennie, and K. J. McCallum
1967 Factors Affecting the Accuracy of the Carbon-Dating Method in Soil Humus Studies. *Soil Science* 104:81-85.

Fenneman, N. M.
1931 *Physiography of Western United States.* McGraw-Hill Book Company, Inc., New York.

Geyh, M. A., J. H. Benzler, and G. Roeschmann
1975 Problems of Dating Pleistocene and Holocene Soils by Radiometric Methods. In *Paleopedology: Origin, Nature, and Dating of Paleosols*, edited by D. H.

Yaalon, pp. 63-75. Israel University Press, Jerusalem.

Grosser, R. D.
1970 The Snyder Site: An Archaic-Woodland Occupation in South-Central Kansas. Unpublished Master's thesis, Department of Anthropology, University of Kansas, Lawrence.

1973 A Tentative Cultural Sequence from the Snyder Site, Kansas. *Plains Anthropologist* 18:228-238.

Haas, H., V. Holliday, and R. Stuckenrath
1986 Dating of Holocene Stratigraphy with Soluble and Insoluble Organic Fractions at the Lubbock Lake Archaeological Site, Texas: An Ideal Case Study. *Radiocarbon* 28:473-485.

Hajic, E. R.
1990 *Koster Site Archeology I.* Research Series 8. Kampsville Archeological Center, Center for American Archeology, Kampsville, Illinois.

Hall, S. A.
1977a Geology and Palynology of Archaeological Sites and Associated Sediments. In *The Prehistory of the Little Caney River, 1976 Season*, edited by D. O. Henry, pp. 13-41. Contributions in Archaeology No. 1. Laboratory of Archaeology, University of Tulsa, Tulsa, Oklahoma.

1977b Geological and Paleoenvironmental Studies. In *Prehistory and Paleoenvironment of Birch Creek Valley*, edited by D. O. Henry, pp. 11-31. Contributions in Archaeology No. 3. Laboratory of Archaeology, University of Tulsa, Tulsa, Oklahoma.

Holien, C.
1982 *Origin and Geomorphic Significance of Channel-Bar Gravel of the Lower Kansas River.* Unpublished Master's thesis, Department of Geology, University of Kansas, Lawrence.

Horsch, M. L.
1980 *Soil Survey of Cowley County, Kansas.* U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C.

Hoyer, B. E.
1980 The Geology of the Cherokee Sewer Site. In *The Cherokee Excavations: Holocene Ecology and Human Adaptations in Northwestern Iowa*, edited by D. C. Anderson and H. A. Semken, Jr., pp. 21-66. Academic Press, New York.

Johnson, W. C.
1989 Geomorphology of the Perry Lake Project Area. In *Archaeological Investigations in the Perry Lake Project Area, Northeast Kansas: National Register Evaluation of 17 Sites*, edited by Brad Logan, pp. 22-48. Submitted to the U.S. Army Corps of Engineers, Kansas City District.

Johnson, W. C., and C. W. Martin
1987 Holocene Alluvial-Stratigraphic Studies from Kansas and Adjoining States of the East-Central Plains. In *Quaternary Environments of Kansas*, edited by W. C. Johnson, pp. 109-122. Guidebook Series 5. Kansas Geological Survey, Lawrence.

Kuchler, A. W.
1974 A New Vegetation Map of Kansas. *Ecology* 55(3):586-604.

Leaf, G. R.
1981 Woodland Occupation of the Snyder Site (14BU9). In *Prehistory and History of the El Dorado Lake Area*, edited by M. J. Adair, pp. 169-236. Project Report Series No. 47. Museum of Anthropology, University of Kansas, Lawrence.

Mandel, R. D.
1987 The Environment of Kansas. In *Kansas Prehistoric Archaeological Preservation Plan*, edited by K. L. Brown and A. H. Simmons, pp. 3.1-3.30. Office of Archaeological Research, Museum of

Anthropology, and Center for Public Affairs, University of Kansas, Lawrence.

1990a Preliminary Report: Geomorphological Investigations of Archaeological Sites at Arkansas City, Kansas. Submitted to the U.S. Army Corps of Engineers, Tulsa District.

1990b Geomorphology and Stratigraphy of the Stigenwalt Site. In *The Archeology of the Stigenwalt Site, 14LT351*, by R. M. Thies, pp. 138-145. Contract Archeology Publication No. 7. Archeology Office, Kansas State Historical Society, Topeka.

1992a Geologic Potentials for Buried Archeological Sites in the Whitewater River and Doyle Creek Watersheds, Southeast Kansas. Ms. on file, Archeology Office, Kansas State Historical Society, Topeka.

1992b Soils and Holocene Landscape Evolution in Central and Southwestern Kansas. In *Soils in Archaeology*, edited by V. T. Holliday, pp. 41-117. Smithsonian Institution Press, Washington, D. C.

1993a Geomorphology. In *Phase II Cultural Resource Survey of High Potential Areas within the Southeast Kansas Highway Corridor*, edited by T. Weston, pp. 44-121. Contract Archeology Publication No. 10. Archeology Office, Kansas State Historical Society, Topeka.

1993b Geomorphology. In *Cultural Resource Investigations for the U.S. Highway 166 Corridor*, edited by M. F. Hawley, pp. 24-75. Contract Archeology Publication No. 11. Archeology Office, Kansas State Historical Society, Topeka.

1994 Geomorphology and Holocene Alluvial Stratigraphy of the Walnut River Valley at Arkansas City, Kansas: Implications for Archeological Research. Submitted to U.S. Army Corps of Engineers, Tulsa District.

n.d. Geomorphic Controls of the Archaic Record in the Central Plains of the United States. In *Archaeological Geology of the Archaic Period (8 to 3 ka) in North America*, edited by E. A. Bettis III. Special Paper. Geological Society of America, in press.

Mandel, R. D., J. D. Reynolds, B. G. Williams, and V. A. Wulfkuhle

1991 *Upper Delaware River and Tributaries Watershed: Results of Geomorphological and Archeological Studies in Atchison, Brown, Jackson, and Nemaha Counties, Kansas*. Contract Archeology Publication No. 9. Archeology Office, Kansas State Historical Society, Topeka.

Martin, C. W.

1992 Late Holocene Alluvial Chronology and Climatic Change in the Central Great Plains. *Quaternary Research* 37:315-322.

May, D. W.

1991 Radiocarbon Ages of the Elba Valley Fill in Cooper's Canyon, Elba, Nebraska. *Proceedings of the Nebraska Academy of Sciences* 111:59-60.

1993 Soils in Middle and Late Holocene Alluvium. In *Field Excursion of the Second International Paleopedology Symposium*, edited by W. C. Johnson, pp. 15.1-15.11. Open-File Report 93-30. Kansas Geological Survey, Lawrence.

North American Commission on Stratigraphic Nomenclature

1983 North American Stratigraphic Code. *The American Association of Petroleum Geologists Bulletin* 67:841-875.

Rohn, A. H., B. M. Larson, and M. S. Davis

1982 A Survey and Assessment of the Cultural Resources at Kaw Lake, Northern Section (Kansas). Archaeology Laboratory, Wichita State University. Submitted to U.S. Army Corps of Engineers, Tulsa District.

Root, M. J.
1981 *The Milbourn Site: Late Archaic Settlement in the Southern Flint Hills of Kansas*. Unpublished Master's thesis, Department of Anthropology, University of Kansas, Lawrence.

1982 Excavations at the Milbourn Site (14BU25). In *Archaeological Investigations at El Dorado Lake, Butler County, Kansas (Phase III)*, edited by P. E. Brockington, Jr., pp. 95-215. Project Report Series 51. Museum of Anthropology, University of Kansas, Lawrence.

Scharpenseel, H. W.
1975 Radiocarbon Dating of Soils--Problems, Troubles, Hopes. In *Paleopedology: Origin, Nature, and Dating of Paleosols*, edited by D. H. Yaalon, pp. 77-88. Israel University Press, Jerusalem.

Schoewe, W. H.
1949 The Geography of Kansas, Part 2, Physical Geography. *Kansas Academy of Science Transactions* 52:261-333.

Soil Survey Staff
1990 *Keys to Soil Taxonomy*. SMSS Technical Monograph No. 19. Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Thies, R. M.
1991 Archeological Resources of Selected Portions of the Lower Walnut River Valley: Results of the 1990 Investigation. Submitted to U.S. Army Corps of Engineers, Tulsa District. Ms. on file, Archeology Office, Kansas State Historical Society, Topeka.

Thoms, A. V.
1979 Cultural Resources Reconnaissance and Preliminary Assessment for the Arkansas City Local Flood Protection Project, Cowley County, Kansas. Submitted to U.S. Army Corps of Engineers, Tulsa District.

Wedel, W. R.
1959 *An Introduction to Kansas Archeology*. Bulletin 174. Bureau of American Ethnology, Smithsonian Institution, Washington, D.C.

NOTES ON GREAT BEND ASPECT CERAMIC VESSELS IN THE KSHS COLLECTIONS

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An inventory of reconstructed Great Bend aspect and antecedent Bluff Creek and Pratt complex vessels in the Kansas State Historical Society collections produced a surprisingly large sample of 29 vessels. A data base of metric and nonmetric attributes was collected from the sample. Preliminary analysis and comparisons produced general agreement with existing typologies. A few observations were made. One vessel has a previously unreported brushed surface treatment. A complete red-filmed bottle form and an angular shouldered bottle form were observed in the sample. In addition to the amphora jar form, there is a broad jar form. In this sample the larger jar forms tend to be shell-tempered Cowley ware. Using metric attributes of vessel height, rim diameter, and capacities, no clear pattern of vessel sizing could be discerned. There appears to be a continuum of vessel sizes. More work needs to be done to tie ceramic trends into the Great Bend aspect sequence.

This study began in response to the simple question: "How many Great Bend aspect vessels does the Kansas State Historical Society (KSHS) have in its holdings?" After looking over reconstructed vessels in storage, offices, glass cases, and the Kansas Museum of History the count totaled 28 Great Bend vessels. Some vessels in the collections from a possibly related complex, namely Bluff Creek, were tallied as well.

The proveniences of the vessels are varied. Sixteen are from the Paint Creek site (14MP1), eight are from the Thompson site (14RC9), one is from the Tobias site (14RC8), and one is from 14CO332, a Lower Walnut site in Cowley County. Of less certain provenience are two pots, one from an unspecified location in the Lindsborg vicinity and another possibly from either the Paint Creek site in McPherson County or the Thompson site in Rice County. The majority of the vessels were donations from private collectors, a portion were repatriated from the Nebraska State Historical Society, and two are from KSHS excavations at 14RC8 and 14CO332. Four additional vessels were considered for comparative purposes: three from Bluff Creek sites (14SR303 and 14SR305) and one from a Rush County site (14RH301); all were acquired through KSHS excavations. Two vessels from the repatriated collection were excluded from the study since they are mostly plaster. Three vessels, two from 14MP1 and one from a Bluff Creek site, were not available as they are on permanent display at the Kansas Museum of History. Therefore, the sample for this study is 29 vessels.

Formal study of each vessel involved recording nonmetric attributes and metric data. The formal attributes are vessel form, decoration, presence and placement of handles, temper, surface treatment, and lip treatment (Tables 1, 3, 5, and 6). Measurements recorded in metric units are vessel height, maximum vessel diameter, rim diameter, neck diameter, base diameter, and the heights of body, shoulder, and rim (Tables 2, 4, and 7). Vessel capacities were estimated using measured quantities of styrofoam packing pellets. Each vessel was photographed (Figures 1-3). It should be noted that three of the vessels in this study were illustrated and reported by Wedel (1934:238, Plate XIV).

The Great Bend aspect, defined by Waldo R. Wedel (1947, 1959) of the U.S. National Museum, Smithsonian Institution, consists of two

foci: the Lower Walnut focus, centered in Cowley County, and the Little River focus, located in Rice and McPherson counties.

The Lower Walnut focus was named for three sites in the lower Walnut River drainage near Arkansas City. The sites produced about 1,300 sherds and 8 restorable vessels. On the basis of the sample, Wedel (1949) defined a single ware, which he named Cowley Plain. The attributes of this ware include smoothed exterior surfaces, uneven interiors, shell tempering, flaky, fined textured paste, and colors ranging from buff to gray. Rim forms are generally unthickened and straight to slightly flaring with heights ranging from 2 to 7 cm. Vessel lips are usually rounded, though flattened forms are present. Lip decoration in the form of diagonal incising is sometimes found. Appendages exist as paired loops or strap handles. These handles are attached by riveting on or above the shoulder and below the lip. Handle decoration, when present, includes punctations and/or molded nodes, which may be rounded and/or flattened. Decorations could be placed at either or both ends of the handles (Wedel 1949).

Identified Cowley Plain vessel forms include both jars and bowls. The jars are ovate to globular in shape with flat circular bases, rounded shoulders, and constricted necks. Heights vary from 19.5 cm to 28 cm. Maximum vessel diameters range from 17.5 to 26.6 cm. While much less common, Wedel (1959:361) does document bowl forms. Bowls have rounded shoulders with slightly constricted necks and flaring rims. Strap handles, attached from the lip to below the neck, are sometimes present (Wedel 1949).

The Little River focus is defined from the work in Rice County at the Tobias (14RC8), Thompson (14RC9), and Malone (14RC5) sites (Wedel 1942, 1947, 1959). Wedel (1949) discerned a single ware for the focus, called Geneseo, which he subdivided into three types: Geneseo Red-Filmed, Geneseo Plain, and Geneseo Simple Stamped. Geneseo types are sand-tempered. Geneseo Plain has a fine- to medium-textured paste. Exterior surfaces are smoothed with uneven interiors. Colors range from dark gray to brown. The rims are simple with necks straight to slightly flaring; neck height varies from 2.5 to 8 cm. Lip finishes are rounded, flattened, or slightly flaring. Lip decoration, when present, takes the form of diagonal incising. Appendages may include paired loop handles and vertical lugs, which may or may not contain perforations. The loop handles are riveted, attached from the rim to the upper body, and decorated with nodes at either or both ends of the handles. Additional decoration--incising and punctating--sometimes occurs. Decoration on the necks of vessels consists of applied fillets in single or double rows. Fillets may be plain or diagonally incised. Similar decoration involves single or double lines of pinched or gouged nodes, closely spaced around the neck. Vessel forms are ovate, amphora-like jars with rounded shoulders and constricted necks; bases are round or flat. The jars range in height from 21 to 36 cms and have maximum diameters of from 19 to 31 cms.

The second Geneseo ware is Geneseo Simple Stamped. The ceramics are similar to Geneseo Plain except for an overall exterior surface treatment of simple stamping, applied with a grooved or wrapped paddle while the clay is still plastic. Stamping is oriented either vertically or diagonally. Some flattening and obliterating of stamp impressions is common. Stamping is found primarily on the vessel body but can occur up to the neck lip. Stamping may not be complete over the entire vessel, which can create problems in identifying individual sherds or handles. Rim decorations, such as fingernail gouging and pinched nodes, are similar to those on Geneseo Plain. However, the vessel forms differ slightly from the Geneseo Plain type in that they are broader and shorter (Wedel 1949).

The third ceramic type in the Little River focus assemblage is Geneseo Red-Filmed (Wedel 1949, 1959). The paste for this type is fine with the temper, once again, typically being fine sand. Sherd colors vary from buff to light brown. Exteriors are smoothed, and interiors are uneven. The exterior surfaces are covered with dull to bright red films, often unevenly applied. Bare patches frequently expose the underlying clay bodies. Vessel forms are quite different from other Geneseo ware forms.

Handles are of two varieties: riveted loops or vertical, thick, wedge-shaped, perforated lugs. All of the massive lugs are red filmed, and red filming is occasionally found on cordmarked and simple stamped body sherds. At the Tobias site Wedel recovered two partially restorable vessels that are classified as red-filmed. One (USNM 388590) is the top half of what appears to be a pear-shaped bottle form with an in-sloping rim, constricted mouth, and two perforations below the lip. The second is a miniature globular vessel (USNM 388624), which has a height of 5.2 cm, diameter of 6.1 cm, and rim diameter of 1.5 cm. It has perforations on each side of and just below the rim. The vessel surface is a mottled grayish color with traces of a pink wash and tentatively was placed in the red-filmed type (Wedel 1959:241).

An additional minor type of surface treatment, reported by Wedel (1959:243) at the Tobias site, is check stamping. One restored jar and four other body sherds from Tobias have this type of surface treatment. Otherwise, the vessel shares similarities with Geneseo Simple Stamped ware.

Another surface treatment noted by Wedel (1959:242), but which occurred in only trace amounts, is cord-roughening. Wedel suggested affinities with Upper Republican ceramics. The paste of the cord-roughened sherds is fine and compact with coarse gravel temper. Associated vessel forms are unknown. Smith (1949) found additional specimens of this type at the Major site (14RC5), which he named Little River Cord Roughened, adding another type to Great Bend aspect ceramics. At the Major site, cord-roughened sherds were found in a deeper refuse mound deposit, perhaps indicating an earlier vessel treatment. Smith (1949:295) reiterated a connection to Upper Republican ceramic traits.

Little River and Lower Walnut foci vessel forms are, as Wedel (1959:361) observed, generally very similar. That is, vessel forms include ovate, amphora-like jars with riveted handles, set between the lip and shoulder, and simple vertical to flaring rims. A difference in ceramics of the two foci is a tendency for flat bases and handles to occur less often in Little River than in the Lower Walnut Cowley Plain pottery. Bowl forms are not in evidence from the Rice County sites (Wedel 1949, 1959).

The temporal depth and spatial extent of the Great Bend aspect are not well defined. Most of the dating of Great Bend sites has been based on cross-dates from Southwestern ceramics found in both Little River and Lower Walnut sites, as well as the presence or absence of European contact materials. To date, items of European manufacture have been found in the Little River sites and at 14MN328 (Lees et al. 1989); the presence of contact items from Lower Walnut sites has not been substantiated (Hawley et al. 1994). The few radiocarbon dates obtained from Lower Walnut sites in Cowley County range from about A.D. 1325 to 1765 (Hawley et al. 1994:Figure 7; Thies 1991). One vessel in this study was excavated from a trash-filled storage pit feature at 14CO332. A radiocarbon assay from the pit dates it to around A.D. 1600. The vessel, which has an elaborately decorated lip, is not typical in Lower Walnut or Little River ceramic assemblages. Five radiocarbon dates have been obtained from the Tobias site; four of these are deemed modern. The fifth is A.D. 1780 (O'Brien 1984:75). Southwestern sherds from the Tobias site range in age from A.D. 1450 to 1720 (Wedel 1982:146). Based on available radiocarbon and Southwestern ceramic cross-dates, the reconstructed pottery vessels used for this study date from A.D. 1400 to 1700.

The spatial distribution of the vessel sample is extremely biased to the Little River focus. Twenty-five of the vessels come from sites in Rice and McPherson counties, the core area of Little River. In contrast the Lower Walnut focus is represented by only one vessel from Cowley County.

For comparative purposes three vessels in the study sample are from Middle Ceramic sites believed to be antecedent to the Great Bend aspect. Two are from Bluff Creek sites, 14SR303 and 14SR305, in Sumner County, directly west of Cowley County. A single vessel, tentative placed in the Pratt Complex, is from 14RH301 in Rush County, which lies west of McPherson and Rice counties. The Bluff Creek ceramics show strong similarities to Geneseo wares with shared traits of vessel forms, handles,

and flat bases (O'Brien,1984:63). The Bluff Creek Buresh site (14SR303) ceramics share traits of both Central Plains tradition and Washita focus of the southern plains. The former are globular vessels with direct and collared rims, and the latter are amphora-like jars with strap handles (Witty 1978:62-62). Of the Bluff Creek vessels one from 14SR305 (Figure 3g) is a low necked, rounded shoulder, broad, handleless jar with a concave base, and a finely cordmarked surface. The vessel is reminiscent of the Great Bend amphora form. The second Bluff Creek vessel from 14SR303 (Figure 3f) has a conical cordmarked body, rounded shoulder, low out-flaring rim, diagonally incised lip, and opposing strap handles. The Rush County vessel from 14RH301 (Figure 3e) has a conical cordmarked body, rounded shoulder, low out-flaring rim, and opposed strap handles. Decoration on the vessel includes vertically incised strap handles, diagonally incised lip, and wide pinched nodes, closely spaced around the neck. The pinched neck nodes are similar to decorations found on Little River Geneseo vessels.

Using Wedel's established types of Geneseo and Cowley wares, the sample sorts into: 14 Geneseo Plain, 5 Geneseo Simple Stamped, 2 Geneseo Red-Filmed, 4 Cowley Plain. One vessel has a brushed surface that was not reported in Wedel's work. The body of this small globular jar (Figure 1b) is covered with vertical brushing; the neck, with partial horizontal brushing.

Since the sample is of reconstructed vessels, another approach to the analysis would be to sort the sample based on vessel form. The Great Bend ceramic assemblage has three forms: bowls, jars, and bottles. Wedel recognized a class of bowl forms from the Lower Walnut, which were not found in Little River or observed in this sample. The most prevalent vessel form is the jar. Three forms of jars were observed in this sample: amphora, globular, and broad.

The amphora is the most characteristic form of Great Bend ceramics (Figures 1h-m, 2a, 2e-h, and 3d). It has a flat base, subconical body, rounded shoulder, high direct rim, and handles attached at the shoulder. The amphora is a complex compound form with variations in base width, body width, body height, shoulder height, neck constriction, rim height, and angle. The finishing details on jars are the areas that receive decorations. On the rim lip finish is flat or rounded and plain or decorated with punctates or diagonally incising. The diagonal incising on the lip is oriented to the left-right or right-left, which may indicate whether the potter was right or left handed. The most decorative expression in this sample is the treatment of the handles and their placement on the vessels. Handles appear to be one of the last elements finished on the vessels. The handles are riveted on, so holes have to be drilled and the handles placed symmetrically on the bodies. This finishing detail and the plastic nature of the clay in this contemplative task gave the potter freedom to manipulate and explore the handle treatment. Variations in handles exist from simple round loops to rectangular straps to variants of tapered, oval, ridged, and concave handle forms. Handle surfaces are further decorated with applied nodes, incised lines, and punctates.

The globular form has a spherical body with straight to out-flaring rim (Figures 1a-c and 3b). Globular jars vary from simple, almost pinch-pot quality, to finely finished spherical vessels.

The third and somewhat problematic jar form is the broad style (Figure 1d-f and 2b-d. The broad jar is defined on the basis that its width is greater than its height; the wider body produces an increased rim diameter. Additional traits are lower necks and handles attached from the lip to the shoulder. Bases are both rounded and flat, and bodies are subconical.

A major problem in vessel form classification is the gray areas among groups where attributes are shared. This is particularly problematic and evident between the amphora and broad jar forms. Where traits of conical bodies and flat bases are shared, it may be easier to call broad jars squatty amphoras. The problem of broad jar forms was approached using metric attributes of height and width. All vessels heights were plotted against width in a X-Y graph (Figure 4). Of course, the plots falling below the midpoint line are vessels with widths greater than heights. Visual examination of the

vessels showed them to share traits of low necks and handles (when present) attached from the lip to the shoulder (14MP1:71.138.1105, KMpl-30, 71.138.1108, 14RC9:63.8.374, 61.34.3, and 63.8.369).

Water bottles are defined by attributes of constricted mouths, low rims, in-sloping shoulders (Figures 1g and 3c). Two shoulder forms exist: rounded and angular. Lower bodies are subconical with flat bases. Opposing loop handles are horizontally set on the shoulders. While red film is not exclusively applied to bottle forms, or bottle forms always red filmed, nonetheless red filming is a trait associated with water bottles. The filming is considered fugitive since it often appears spotty.

An attempt was made to see if vessels could be separated into size grades in order to derive a folk classification. The method used was to create simple graphs that plotted ranges of the metric attributes of vessel height, rim diameter, and vessel capacity (Figures 5, 6, and 7). Looking at the plot of vessel heights, there is a steady vertical climb. At the low end there is a cluster of five vessels from 10.3 to 14.5 cms in height. The strongest mode of three vessels at 22 cms are vessels that show a diversity of jar forms: amphora, globular, and broad. The graph of rim diameters (Figure 6) is low and slow climbing from 10.2 to 26 cm with several modes at 11, 15, 17, 18, and 22 cm. Once again, looking at the vessels in these modes, there is diversity of vessel forms. In the vessel capacity graph (Figure 7) there is a steady climb from 1 to 12 liters with two outliers at 17 and 30.27 liters. On the lower end are two small breaks occurring between 2 to 3 liters and 4 to 6 liters. Examining the 1- to 2-liter grouping, there is a diversity of forms: amphora, globular, and broad jars. The 3- to 4-liter group is comprised of two red-filmed water bottles, a globular jar, and an amphora. In the 5- to 6-liter group are amphora and broad jars. The 6- to 12-liter group are amphora and broad jars with the two amphora outliers. In using simple plots of metric attributes to sort out vessel size grades, no clear size grading was evident. The vessel sample seems to demonstrate a continuum from small to large vessels. Jar forms are not limited or defined by height or capacity. The one vessel form that does show consistency is the red-filmed water bottle, but this is based on a very small sample size of two. It should be noted that a partially reconstructed bottle from the Tobias site (USNM 388590) measures at least 31 cm in diameter (Wedel 1959:241), suggesting size variation within the bottle form as well.

Wedel's observation of pink slip on a miniature vessel from the Tobias site could perhaps be attributed to clay body color and not application of a slip. A pink to burgundy clay body has been observed on ceramics from the Sharps Creek site and on vessels in this study sample. The pink color is most likely attributable to impurities in the local clay that oxidize to a pink burgundy in firing. Wedel (1935:242) reports lavender sherds from the Paint Creek site and attributes it to high iron content in the clay and poor firing technique.

An attribute that stands out is the association of shell tempering with larger vessel forms. The five shell-tempered vessels are Cowley Plain: four are amphora forms with handles and flat bases (Figures 1m, 2g, 2h, and 3d), and the fifth vessel from 14CO332 is subconical with a rounded base and elaborate lip decoration, consisting of four sets of four tabs (Figure 3a). As illustrated in the capacity graph, four of the shell-tempered vessels fall within the eight largest vessels, with the two largest both being shell-tempered. Three of the vessels were found on Little River focus sites. The vessel heights in Lower Walnut range from 7 to 26 cm; in Little River, from 21 to 36 cm, with the Geneseo wares being larger than the Cowley Plain. At the Tobias site of the Little River focus, Wedel (1959:243) recovered shell-tempered sherds from large jar forms like those of the Geneseo series. The higher occurrence of larger vessels being shell-tempered may be due to the small sample size. On the other hand, the use of shell tempering in larger vessels may speak of the desirability of shell temper, the shell tempering producing lighter and more durable vessels. The presence of larger shell-tempered Cowley Plain vessels in Little River sites maybe a technological choice of selecting shell for tempering, or it could be the result of

contact and exchange among groups. The absence of smaller shell-tempered vessels suggests a degree of selectivity.

Reconstructed vessels in ceramic analysis give form and dimensions to otherwise fragmented rim and body sherds. The moderate number of vessels in this sample provides a glimpse into the range and variability, as well as the overall similarities, of the assemblage. Generally the sample is in agreement with Wedel's (1959) typology, with a few surprises of previously unreported items. However, it should be stressed that this sample lacks traits reported by Wedel, such as bowl forms, check stamping, and elaborate rim decorations. The addition of vessels from the theorized antecedent cultures is a nice gesture that needs to be expanded upon greatly. More analysis and work on the earlier complexes, such as Bluff Creek and Pratt, can shed more light on their relationships to the Great Bend aspect. The Great Bend aspect itself needs to be filled out spatially and temporally. Further analyses of ceramic assemblages from locality to locality should produce more information on the relationships and exchange between the Little River and Lower Walnut foci. In the future more radiocarbon dating will help in producing a ceramic sequence for Great Bend.

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Table. 1. Nonmetric Attributes of Vessels from the Paint Creek Site (14MP1).

14MP1 Paint Creek	Temper	Surface Treatment	Rim Form	Rim Decoration	Lip Treatment	Lip Decoration	Handles	Handle Decoration	Handle Placement	Base Type	Vessel Form	Ware/Type	Notes
61.34.1	sand	smooth red filmed	in-sloping		rounded		horizontal loop		rim to shoulder		bottle	Geneseo Red-Filmed	angular shoulder red-filmed
63.9.236	sand	brushed	straight		rounded					rounded	globular jar	Geneseo brushed	spalled base brushed surface treatment
63.9.237	sand	simple stamped	in-sloping		tapered		loop		rim to shoulder	flat	amphora	Geneseo Simple Stamped	simple stamping limited to base shoulder & neck smoothed
KMP1-30	sand	smooth	out-flaring		flattened uneven		strap		lip to shoulder	flat	broad jar	Geneseo Plain	heavily spalled
KMP1-31	sand	smooth	in-sloping			diagonally incised L-R				flat	broad jar	Geneseo Plain	pink clay body, angular shoulder, uneven body surface
KMP1-66	shell	smooth	out-sloping		flattened	diagonally incised R-L	loop	node	mid-neck to shoulder	flat	amphora	Cowley Plain	spalling on interior
KMP1-70	sand	smooth lumpy	out-sloping		rounded					slightly flattened	globular jar	Geneseo Plain	uneven base--sits off center
71.138.1105	sand	smooth	out-flaring		flattened	diagonally incised R-L	loop		shoulder	flat	broad jar	Geneseo Plain	miniature form of broad jar
71.138.1106	sand	smooth	straight		flattened	diagonally incised R-L	loop	node incised	rim to shoulder	flat	amphora	Geneseo Plain	
71.138.1107	sand	smooth	out-flaring		flattened		loop	node	neck to on shoulder	flat	amphora	Geneseo Plain	
71.138.1108	sand	smooth	in-sloping		flattened		strap		rim to shoulder	flat	broad jar	Geneseo Plain	
71.138.1109	sand	smooth	out-sloping		tapered		loop		set on shoulder	flat	amphora	Geneseo Plain	
71.138.1110	sand	simple stamped	out-sloping		flattened	diagonally incised L-R	strap	node on each end	neck base to shoulder	flat	amphora	Geneseo Simple Stamped	one handle missing rivet holes exposed
71.138.1111	sand	simple stamped	in-sloping		flattened	diagonally incised L-R	strap		attached on shoulder	flat	amphora	Geneseo Simple Stamped	reconstructed 1/2 of vessel mounted on board, drilled repair holes

Table 2. Measurements of Vessels from the Paint Creek Site (14MP1).

14MP1 Paint Creek	Overall Height	Greatest Diameter	Rim Diameter	Neck Diameter	Neck Height	Shoulder Height	Body Height	Base Diameter	Capacity
71.138.1106	18.5	15.6	11.2	11	3	5	10.5	4	2.12 L 72 oz
71.138.1107	14.5	14.5	12.5	12	4.5	2.5	7.5	4	1.65 L 56 ozs
71.138.1108	25.5	29	22.5	24	2.5	3	20	6	10.4 L 352 ozs
71.139.1109	19	19	15.5	15	4	7.5	7	5	3.31 L 112 ozs
71.138.1110	22.5	22.3	19.5	18.5	5	4	13.5	4.5	5.67 L 192 ozs
71.138.1111	29.5	27.5	20	21.5	7	5	17.5	6.5	
71.138.1105	10.3	13.2	10.2	9.5	2.3	2.5	5.5	2.5	0.94 L 32 ozs
KMp1-30	19.5	26	23	21	3	4.5	12	5	6.62 L 224 ozs
KMp1-31	22	22	17	17	2	1	19	6	5.44 L 184 ozs
KMp1-66	28	26	25	23.5	7	5	16	7	10.4 L 352 ozs
KMp1-70	14	14	11	11.5	2	2	10		1.41 L 48 ozs
61.34.1	22 *	21.5	7.5	8.5	1.7	7.5	13	6.5 *	3.78 L 128 ozs
63.9.236	14	15	13.2	13.3	3.5	2.5	9		1.89 L 64 ozs
63.9.237	26.5	23.5	18.5	18	7	4	15.5	5	6.86 L 232 ozs

Table 3. Nonmetric Attributes of Vessels from the Thompson Site (14RC9).

14RC9 Thompson	Temper	Surface Treatment	Rim Form	Rim Decoration	Lip Treatment	Lip Decoration	Handles	Handle Decoration	Handle Placement	Base Type	Vessel Form	Ware/Type	Notes
61.34.3	sand	smooth	in-sloping		flattened	diagonally incised R-L	strap	3 vertically incised lines	lip to shoulder	rounded	globular jar	Geneseo Plain	
61.34.4	sand	smooth	out-flaring		flattened					flat	amphora	Geneseo Plain	small amphoric form thick walled
63.8.369		simple stamped	straight		flattened	diagonally incised L-R	strap	node and incised	lip to shoulder	flat	broad jar	Geneseo Plain	pink clay body tapered handles
63.8.371	sand	smooth	straight		flattened		strap		on shoulder	flat	amphora	Geneseo Simple Stamped	pink clay body
63.8.372	sand	smooth	in-sloping		flattened		strap	node	on shoulder	flat	broad jar	Geneseo Plain	
63.8.373	shell	smooth	out-sloping		flattened	diagonally incised L-R	strap	double nodes incised punctates	on shoulder		amphora	Cowley Plain	very large vessel partially reconstructed base missing
63.8.374	sand	simple stamped	out-sloping		flattened	impressed oval				rounded	broad jar	Geneseo Simple Stamped	
63.8.370	shell	smooth	straight		flattened	diagonally incised R-L	strap	noded and incised	on shoulder	flat	amphora	Cowley Plain	large jar

Table 4. Measurements of Vessels from the Thompson Site (14RC9).

14RC9 Thompson	Overall Height	Greatest Diameter	Rim Diameter	Neck Diameter	Neck Height	Shoulder Height	Body Height	Base Diameter	Capacity
61.34.3	23	27	17	18	2	5	16		8.27 L 280 oz
61.34.4	12.5	12.5	11	10	2.5	4	6	3.5	0.94 L 32 ozs
63.8.69	27	30	22	22.5	4	4	19	9	11.35 L 384 ozs
63.8.370	32.7	30.7	26	26	5.7	6	21	8.5	17.031 L 576 ozs
63.8.371	31	29	22.5	20.5	7.5	5.5	18	6	11.35 L 384 ozs
63.8.372	24	25.5	17.5	19	5	4	15	4.5	7.56 L 256 ozs
63.8.373	38.5	39	26	25.5	9	1.5	14.5		30.27 L 1,024 ozs
63.8.374	22	28.5	19.5	18.5	4.5	4.5	13		9.46 L 320 ozs

Table 7. Measurements of Vessels from Miscellaneous Great Bend, Bluff Creek, and Pratt Sites.

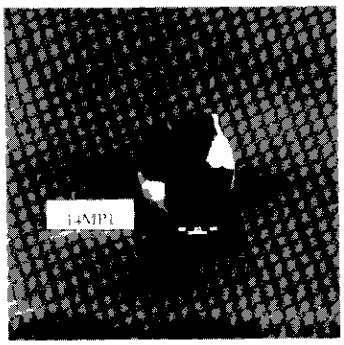
Miscellaneous Vessels	Overall Height	Greatest Diameter	Rim Diameter	Neck Diameter	Neck Height	Shoulder Height	Body Height	Base Diameter	Capacity
04.3.8	20.5	20.5	11	5	1.5	7	12	5	3.78 L 128 oz
14RC8 F. 2449	18.7	19	15	14	2.4	2.8	13.5		3.78 L 128 ozs
61.34.2	21.7	21	18.5	17.5	5.7	4	12	6.5	5.32 L 180 ozs
14CO332 F. 7	26	24.8	16.5	16	3	3	20		8.75 L 296 ozs
14RH301 F. 13	24.5	22	15.5	13.5	3	5.5	16		6.15 L 208 ozs
14SR303 F.75	23	21.5	15	13	1.5	7	23		5.44 L 184 ozs
14SR305 F. 3	24	26.3	18	17	3	4	17	10.5	8.27 L 280 ozs

Table 5. Nonmetric Attributes of Vessels from Miscellaneous Great Bend Aspect Sites.

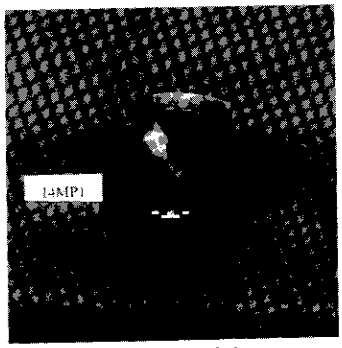
Miscellaneous Great Bend	Temper	Surface Treatment	Rim Form	Rim Decoration	Lip Treatment	Lip Decoration	Handles	Handle Decoration	Handle Placement	Base Type	Vessel Form	Ware/Type	Notes
14RC8,F.2449 12630-A781X2312	sand	simple stamped	out-sloping		flattened					rounded	globular jar	Geneseo Simple Stamped	
61.34.2	shell	smoothed	out-sloping		flattened	oval punctates	loop	node on top of loop	rim to shoulder	flat	amphora	Cowley Plain	
14MP Lindsborg 04.3.8	sand	smoothed red-filmed	in-sloping		rounded		horizontal loop		rim to shoulder	flat	bottle	Geneseo Red-Filmed	rounded shoulder elongated body with flat base
14CO332, F.7	shell & fine sand	smoothed	out-sloping		rounded	4 sets of 4 lobes				rounded	subconical jar	Cowley Plain	elongated body with rounded base elaborate lip decoration

Table 6. Nonmetric Attributes of Vessels from Bluff Creek and Pratt Complex Sites.

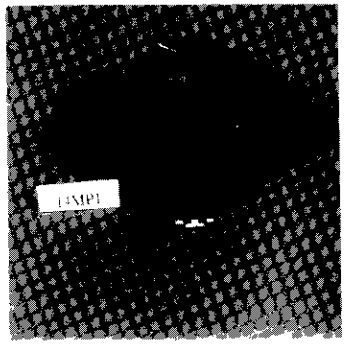
Bluff Creek & Pratt Sites	Temper	Surface Treatment	Rim Form	Rim Decoration	Lip Treatment	Lip Decoration	Handles	Handle Decoration	Handle Placement	Base Type	Vessel Form	Ware/Type
14SR305 384.F.13	sand	cordmarked	out-sloping		flattened					flat	subconical jar with flat base	unnamed
14SR303 F.75	sand	cordmarked	out-flaring		flattened	diagonally incised L-R	strap		lip to shoulder	rounded	conical jar	unnamed
14RH301 391.F.3	sand	cordmarked	out-flaring	pinched nodes	flattened	diagonally incised L-R	strap	vertically incised	lip to shoulder	flat	conical jar	unnamed



a) KMp1-70



b) 63.9.236



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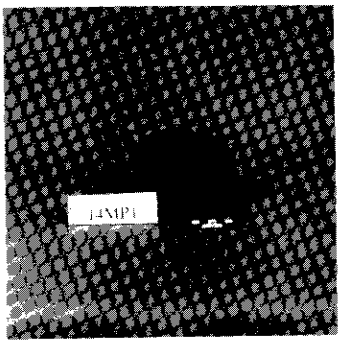
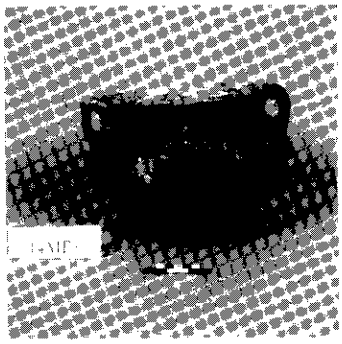


d) 71.138.1105



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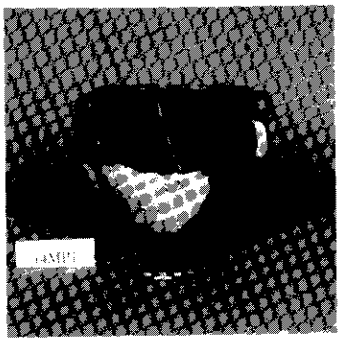
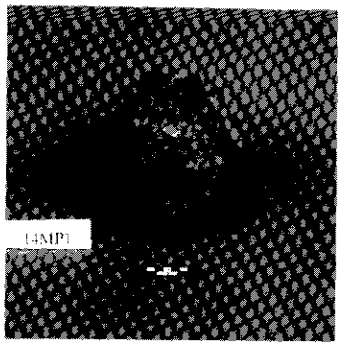
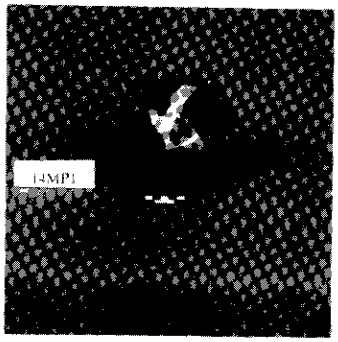


f) 71.138.1108

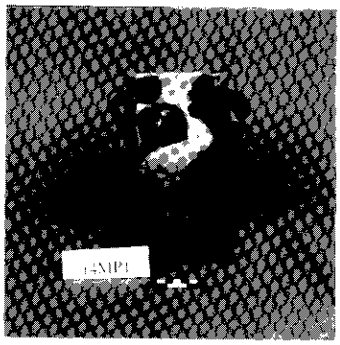
Figure 1. Reconstructed vessels from the Paint Creek site (14MP1).



g) 61.34.1



h) 71.138.1107



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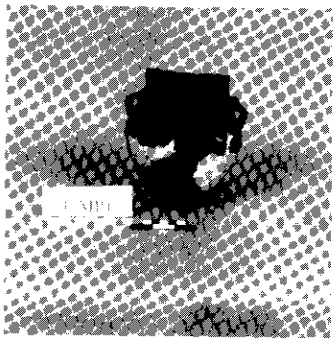

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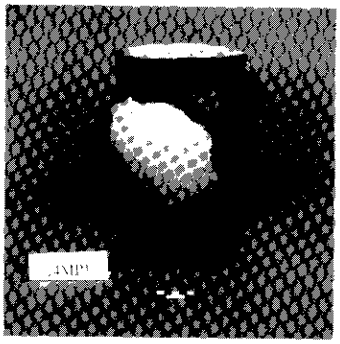
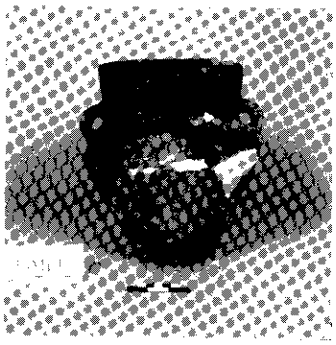
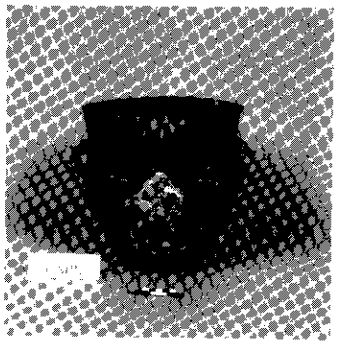


k) 71.138.1110



l) 63.9.237



m) KMp1-66

Figure 1 (continued). Reconstructed vessels from the Paint Creek site (14MP1).

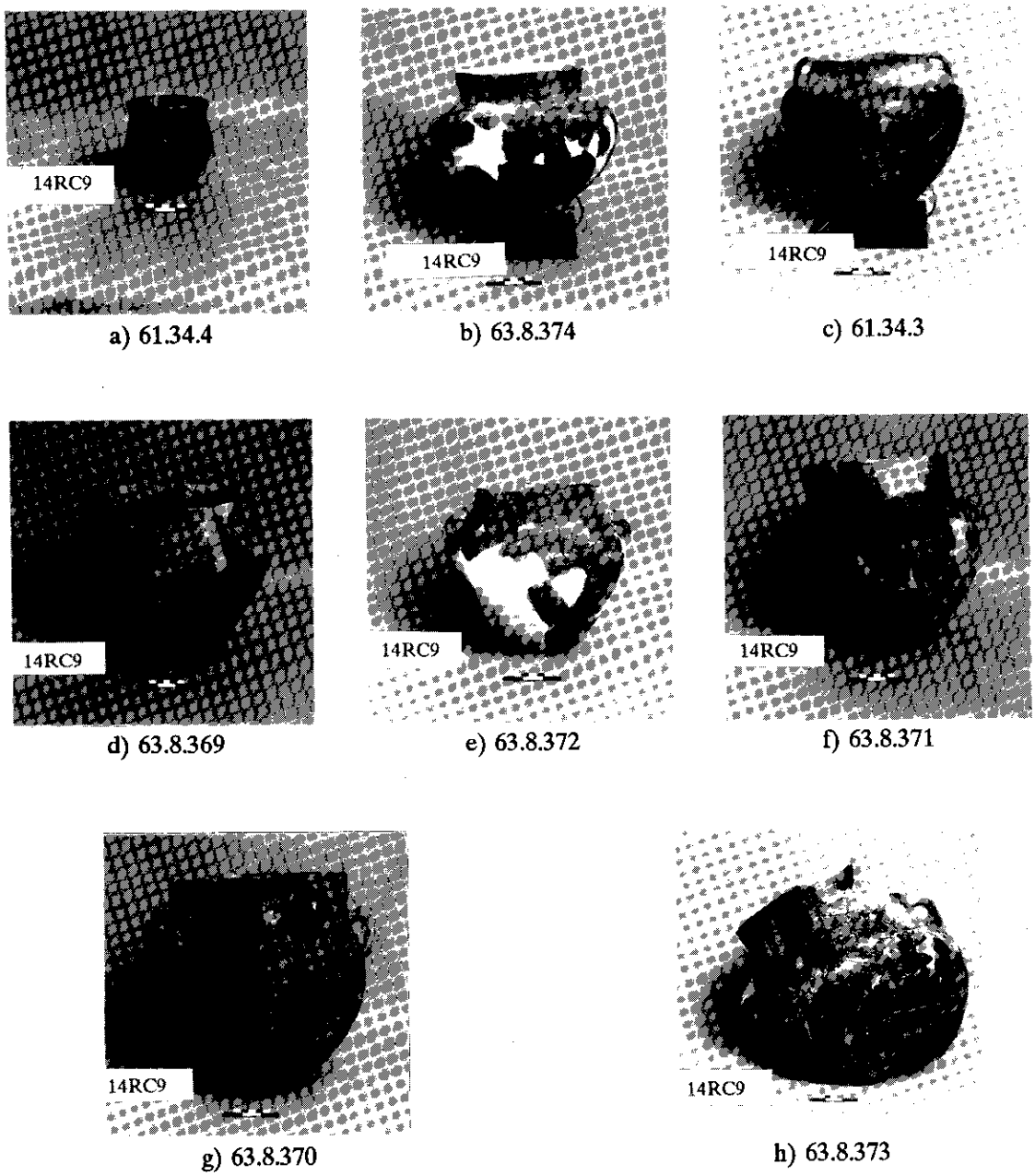
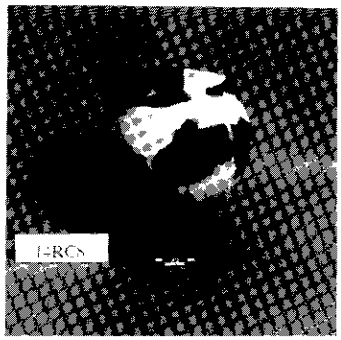


Figure 2. Reconstructed vessels from the Thompson site (14RC9).

a) 14CO332



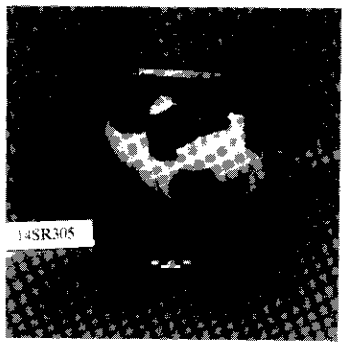
b) 14RC8

c) 04.3.8

d) 61.34.2

e) 14RH301

f) 14SR303



g) 14SR305

Figure 3. Reconstructed vessels from miscellaneous sites.

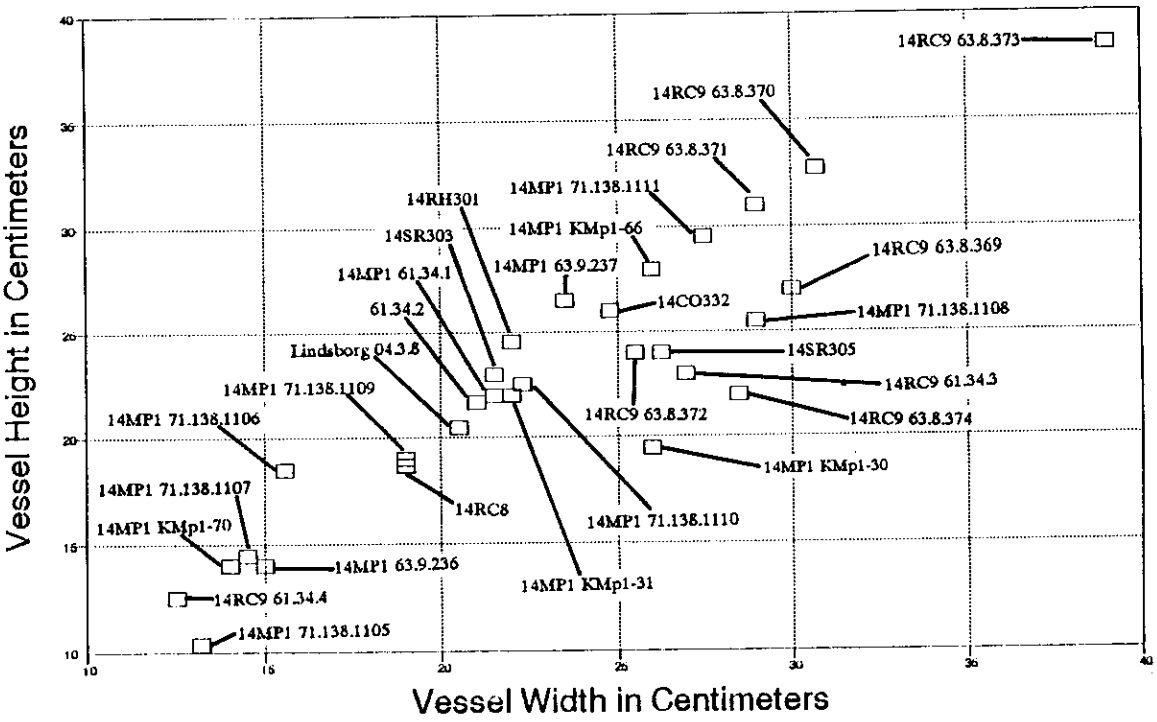


Figure 4. Vessel heights versus widths.

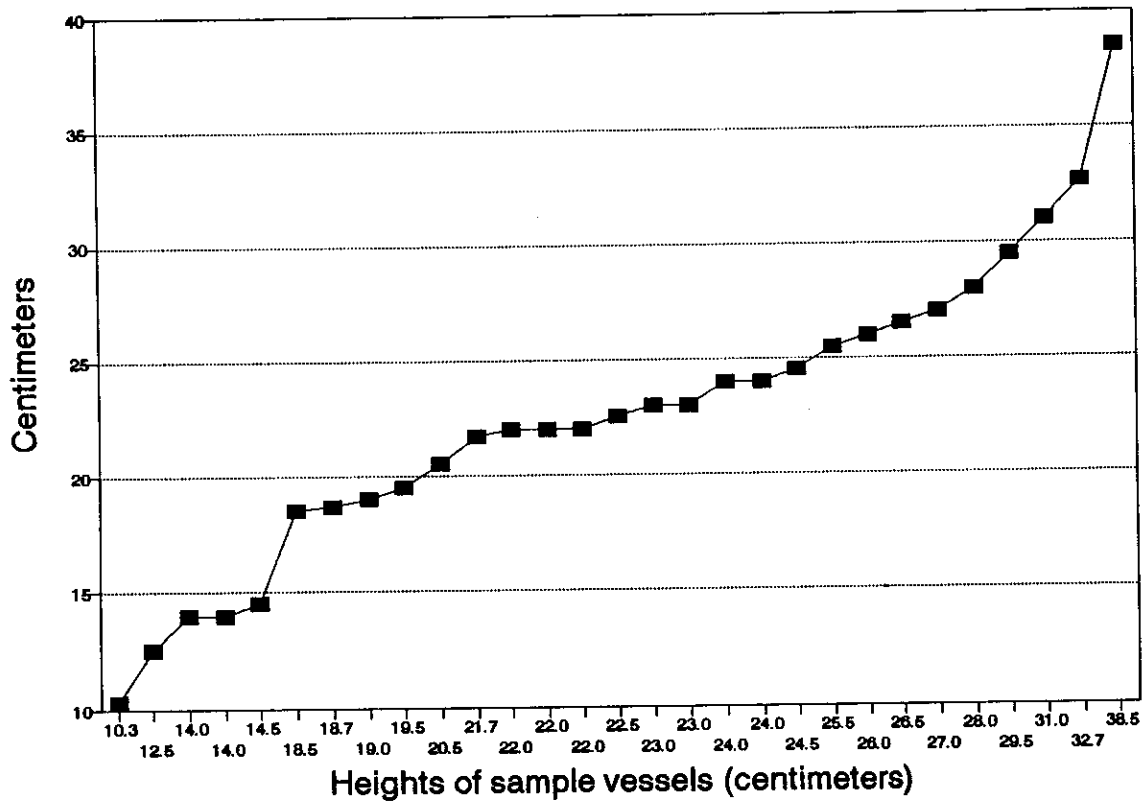


Figure 5. Vessel heights.

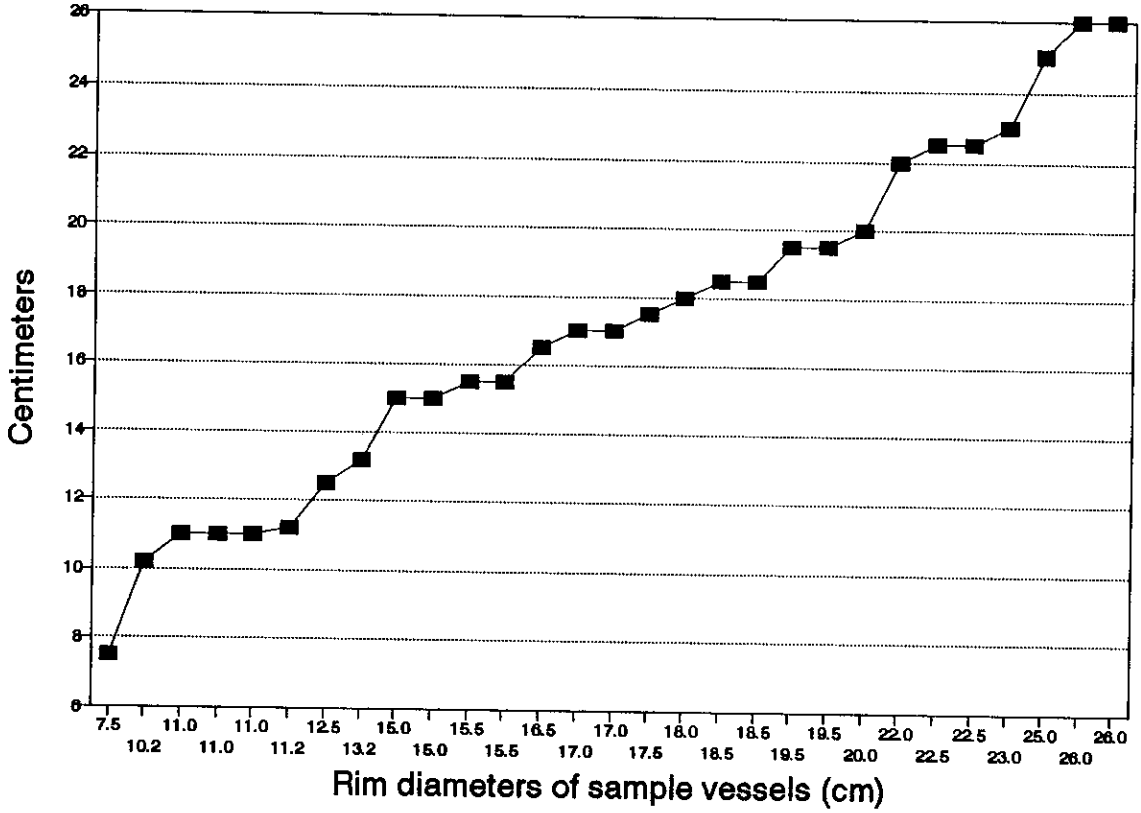


Figure 6. Vessel rim diameters.

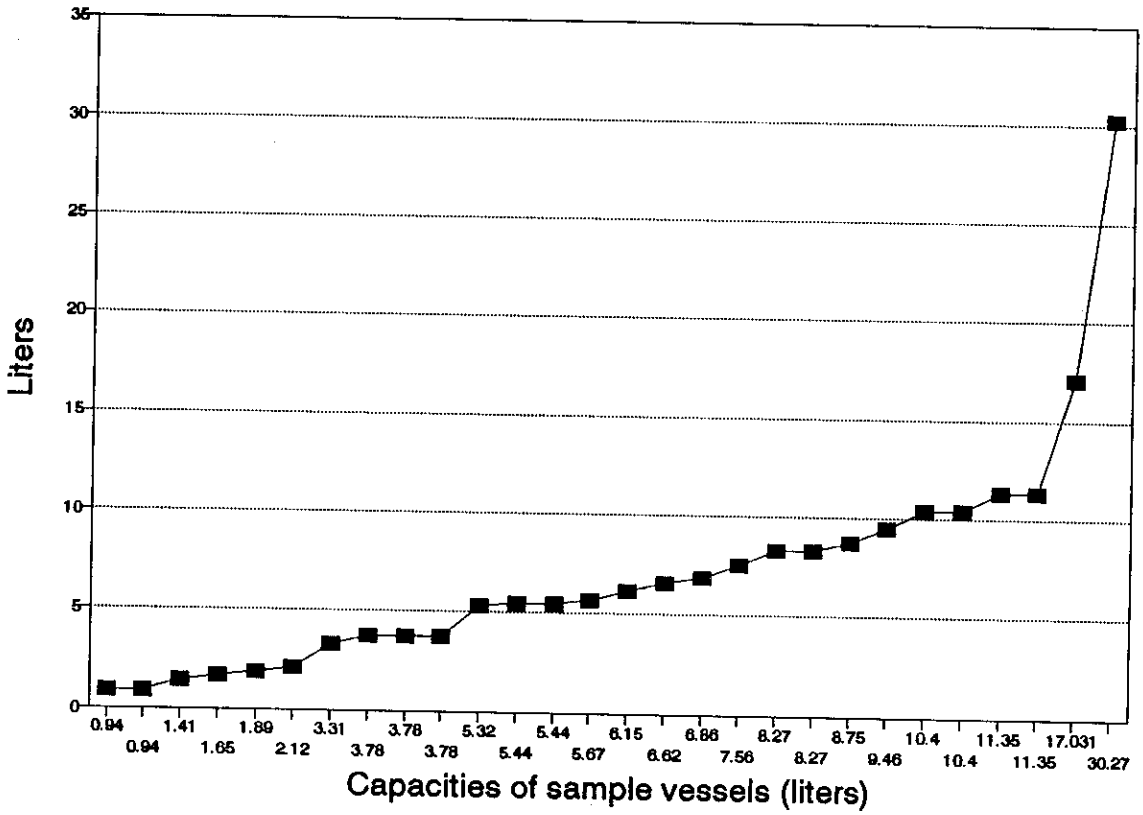


Figure 7. Vessel capacities in liters.

REFERENCES CITED

Hawley, M. F., R. D. Mandel, C. E. Haury, M. King, J. D. Reynolds, and T. Weston
1994 *Archeological and Geomorphological Investigations of Sites in the Vicinity of Arkansas City, Cowley County, Kansas.* Contract Archeology Publication. Archeology Office, Kansas State Historical Society, Topeka (in press).

Lees, W. B., J. D. Reynolds, T. J. Martin, M. J. Adair, and S. Bozarth
1989 Final Summary Report: 1986 Archeological Investigations at 14MN328, A Great Bend Aspect Site along U.S. Highway 56, Marion County, Kansas. Submitted to Kansas Department of Transportation. Ms. on file, Archeology Office, Kansas State Historical Society, Topeka.

O'Brien, P. J.
1984 *Archeology in Kansas.* Public Education Series No. 9. Museum of Natural History, University of Kansas, Lawrence.

Smith, C. S.
1949 Archaeological Investigations in Ellsworth and Rice Counties, Kansas. *American Antiquity* 15(4), Part 1:292-300.

Thies, R. M.
1991 New Data on Lower Walnut Focus. Paper presented at the 49th Plains Anthropological Conference, Lawrence, Kansas.

Wedel, W. R.
1934 Reports on Field Working the Archeology Survey of the Nebraska State Historical Society. *Nebraska History* 15(3):132-255.

1947 Culture Chronology in the Central Great Plains. *American Antiquity* 12:148-156.

1949 Some Central Plains Sherd Types from Kansas. *Proceedings of the Fifth Plains Conference for Archeology*, assembled by J. L. Champe, pp. 86-90. Notebook No. 1. Laboratory of Anthropology, University of Nebraska, Lincoln.

1959 *An Introduction to Kansas Archeology.* Bulletin No. 174. Bureau of American Ethnology, Smithsonian Institution, Washington, D.C.

1982 Further Notes on Puebloan-Central Plains Contacts. In *Pathways to Plains Prehistory: Anthropological Perspectives of Plains Natives and their Pasts*, edited by D. G. Wyckoff and J. Hofman, pp. 145-152. Memoir No. 3 of Oklahoma Anthropological Society and Contributions No. 1 of the Cross Timbers Heritage Association, Duncan, Oklahoma.

Witty, T. A.
1978 Along the Southern Edge: The Central Plains Tradition in Kansas. In *The Central Plains Tradition: Internal Development and External Relationships*, edited by D. J. Blakeslee, pp. 56-66. Report No. 11. Office of the State Archaeologist, University of Iowa, Iowa City.

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Errata for

Shadow Glen: A Late Pomona Variant Occupation in the Lower Kansas River Basin
by Brad Logan and John G. Hedden
The Kansas Anthropologist 14(2):10-30

Page 15, column 2, line 49: ". . .(14OS305) (Wilmeth 1970; Witt 1981). Whether the structure at Shadow Glen was a lodge, ramada, butchering/drying rack, or some other kind of fabrication cannot be inferred from the data at hand. It should be pointed out that though some Pomona structures appear to have been oval in outline, much like those of the earlier Plains Woodland inhabitants of the region, most structures neither have a discernible outline nor seem to reflect any definite house pattern (Witty 1981). The structure at 14JO21-A is consistent with this. . . ."

Page 16, caption: "Figure 3. Lithic artifacts from Shadow Glen. a-f) arrowpoints, g-j) utilized blades and flakes, k) grinding stone (6-cm scale refers this artifact only), l) ground hematite.

Page 27, column 2, line 3: ". . .of about 500 years (ca. A.D. 900-1400) yet. . . ."

Page 27, column 2, line 32: ". . .Missouri, and the Fanning site in southeastern Nebraska and northeastern Kansas has been attributed to Kansa. . . ."

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